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Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Dent Spacer Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding, Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires.

WICKWIRE SPENCER STEEL COMPANY
New York Worcester Buffalo Chicago San Francisco

DETROIT REPRESENTATIVE:
CRAINE-SCHRAGE STEEL CO.
8701 Epworth Boulevard

Wissco WIRE
by Wickwire Spencer

June 11, 1938

When writing to advertisers please mention *Automotive Industries*

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AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 78

Number 24

JULIAN CHASE, Directing Editor
HERBERT HOSKING, Editor
P. M. HELDT, Engineering Editor
JOS. GESCHELIN, Detroit Technical Editor
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Contents

News of the Industry	771
Business in Brief	776
Tools of Tomorrow	780
Calendar of Coming Events	781
Ford Develops Centrifugal Steel Casting	782
Alfa-Romeo Brings Forth a Two-Stroke Diesel	784
Just Among Ourselves	787
Inertia Shock Absorber of New Design. By C. R. Hanna	788
How 100-Octane Fuel is Produced	794
Production Lines	795
Advertisers' Index	43

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C. A. MUSSelman, Pres.; J. S. HILDRETH, Vice-Pres. and Manager, Automotive Division; G. C. BUZBY, Vice-Pres.

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Automotive Industries

Labor

All Quiet on Detroit Front As New Drives Are Announced

Comparative quiet has existed in the Detroit industrial area's usually hectic labor situation since the first of June with a threatened strike of milk drivers stealing the headlines from the United Automobile Workers Union and affiliated CIO organizations.

However, Homer Martin, UAW president, has announced the launching of two new organizing campaigns, the first of which has as its objective the signing up of all non-union parts plants competing with UAW-organized factories; and the other will concentrate its efforts in the aircraft industry.

Tracy M. Doll, Morris Field, and Walter P. Reuther, all members of the international executive board, head the campaign committee for the parts plant drive.

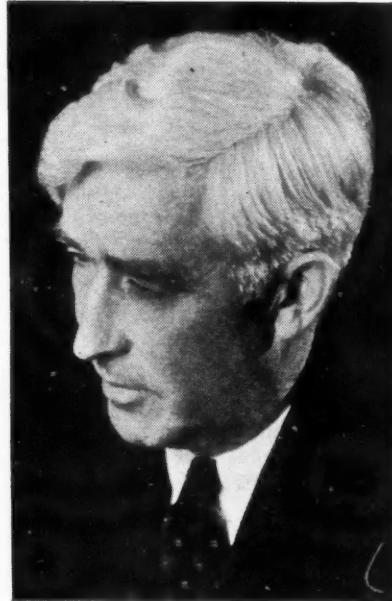
The UAW also planned a special meeting of its executive board this week for the purpose of studying a number of group insurance plans which have been submitted by insurance companies. If a plan is adopted, it was intimated at UAW headquarters, participation would be

(Turn to page 779, please)

Frank H. McKinney

F. H. McKinney, director of Advertising & Sales Promotion for the Packard Motor Car Company, died early Tuesday morning, June 7, after a brief illness at his home in Birmingham, Mich.

Active in Packard merchandising affairs for more than 25 years, he entered the employ of the Packard company, Nov. 25, 1912. He started as a factory workman engaged in the Parts Order Department. His merchandising aptitude early displayed itself and shortly he was transferred to field work, pursuing sales and service activities in Packard retail stores in Pittsburgh and later in Chicago. In 1915 he was returned to the factory in the Truck



GAR WOOD

... addressed the season's final meeting of the Engineering Society of Detroit, Tuesday, with "Speed" as his subject. Major theme was speed on the water, with discussion of experiences in building and racing his famous series of Harmsworth Trophy, Miss America speed boats.

Sales Division. Three years later he moved to the Packard branch at Chicago as truck sales manager of that operation. At the start of 1922 he was named factory truck sales manager and brought back to Detroit in charge of all truck selling activity. In 1923 he was shifted to advertising work, being appointed advertising manager. Ten years later the combined appointment of general sales and advertising manager was his. a joint position he held until 1934 when company expansion gave him the advancement to the position held up until the time of his death.

Brewster Wins Contract

The Navy Department has awarded a \$1,910,395.20 contract to the Brewster Aeronautical Corp., Long Island City, for the construction of an undisclosed number of planes and spare parts.

Production

Slight Increase Due to Assembly Resumption in Ford Plants

Exhibiting a technical increase in production during the current week as compared with its output of a week ago, the automotive industry actually showed little change from the pace established when summer schedules went into effect.

The total production of cars and trucks in the week ending June 11 should approximate 38,900 units, according to a preliminary check of production schedules. This compares with slightly less than 30,000 turned out during the previous week, with the increase almost entirely attributable to the resumption of assembling in the Ford plants, the majority of which did not operate during the week that began with Memorial Day.

There may be slight modifications in schedules during the rest of the month, but best indications are that the industry as a whole should come fairly close to this week's output during the remaining weeks in June, so that the production for the month should run above 150,000 cars and trucks. This will compare with a total output of 211,300 cars and

(Turn to page 778, please)

MacDonald to Head Delegation at Road Congress

Secretary of State Cordell Hull has named Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, as Chairman of the United States delegation to the Eighth International Road Congress at The Hague, June 18 to July 2.

Other delegates named with the approval of President Roosevelt included:

Pyke Johnson, vice-president, Automobile Manufacturers' Association; Donald Kennedy, Michigan, deputy highway commissioner; Robert B. Brooks, Missouri, highway commissioner; T. H. Cutler, chief engineer, Kentucky Department of

(Turn to page 778, please)

"Big Three" Indictments No Surprise

Department of Justice Denies It Is Anxious to Drop Charges

Department of Justice officials have denied published reports that the Government is anxious to drop the charges of anti-trust violation in

indictments returned recently in South Bend, Ind., against the "big three" automobile manufacturers and their affiliated finance companies.

A copyright story in the Detroit Free Press had reported that the Department had such a move under consideration because of "political complications" in Indiana involving Senator Minton, junior Senator from Indiana, and James R. Fleming, U. S. attorney for the Northern District of the state, who obtained the indictments from Judge Thomas W. Slick. Describing Fleming as "a protege" of Senator Minton, the story noted that Minton, whose resolution calling for an FTC investigation of the automobile industry received Congressional and White House approval, had been gunning for the automobile industry for political reasons.

Spokesmen for the Justice Department minimized the report, pointing out that the Department knows nothing about the reputed "political complications," but plans to go ahead with the case. They said the South Bend grand jury was selected for the investigation simply because it was the only one available and in session in the middle west.

They denied there had been any element of surprise connected with the return of the indictments and insisted that since the evidence submitted to the jury marked the second time that it had been presented, the speed with which the jury and district attorney acted was not unusual.

Officials made it clear, however, that they had not closed the doors to negotiations leading to a settlement out of court. In accordance with a recent announcement from the Attorney General, they said that while the Department was not soliciting settlement in that manner, a consent decree would continue to be discussed if the companies involved made such overtures.

Critics subscribing to the same school of thought followed by Judge Ferdinand Geiger who dismissed the grand jury in Milwaukee last December because he felt that consent decree negotiations conducted while a jury was sitting were highly improper, still insist that the Justice Department is more anxious to obtain a civil settlement than it is to take criminal action against the companies. The reason advanced is that the Department can use the criminal action as a threat to effect the re-

forms in the industry which it reportedly desires.

Nevertheless, company attorneys are continuing their conferences with Assistant Attorney General Thurman Arnold, presumably for the purpose of doing away with alleged abuses of which the companies are accused. Department spokesmen said they had been holding conferences with legal representatives of the companies ever since the grand jury investigation was launched last year in Milwaukee and that these meetings are still being held despite the issuance of indictments recently in South Bend.

The indictments named the Ford Motor Co., the General Motors Corp. (Turn to page 774, please)

... slants

WAGE ANALYSIS — *The current "Research Bulletin" of the UAW cites Department of Labor statistics to show that average weekly earnings in the aircraft industry during 1937 were \$27.82 for 42.1 hours' work, while the average worker in the automobile industry during the same period earned \$31.58 for a 35.8 hour week.*

SKY-ROAD — *Chrysler executives were recently treated to a showing of motion pictures of the "Highway in the Sky," the first sections of which have already been completed in Peru. The highway is another link in the much publicized Pan-American Highway.*

THE OLDER THE BETTER — *A tire tread has been developed with non-skid qualities which increase rather than diminish with wear. According to the Fisk Tire Co., tests showed the company's new safety tire had 17 per cent greater traction efficiency after running 18,000 miles than it did when new.*

FASTER SELLERS — *British-made automobiles sell faster in Australia than do those imported from Canada or the United States, according to Hon. Thomas White, minister of trade and customs in Australia. Mr. White said importers were not ordering to the limit of the quota of Canadian and American cars. He commented that British vehicles were selling faster after price reductions, but that Canadian and American makes now cost \$20 to \$80 more in Australia.*



JAMES R. FLEMING

U. S. Attorney for the Northern District of Indiana. Obtained new indictments from Federal Grand Jury at South Bend in finance-company "conspiracy" case moved from Milwaukee after dismissal by Judge Geiger. Described as a protege of Senator Minton, Fleming was sponsored by Senator Van Nuys before Minton entered Senate.



THOMAS W. SLICK

Federal Judge for the Northern District of Indiana. Appointed during the Hoover administration, Judge Slick figured previously in automotive news as judicial arbiter in the reorganization of the Studebaker Corporation.

Genuine Parts Co. Purchases Standardized Parts Corp.

Genuine Parts Co., Atlanta, Ga., has purchased the entire stock holdings (common and preferred) of the Standardized Parts Corp., Memphis, Tenn., as of June 1, 1938. Mr. Malcolm Fraser, president and general manager of Motor Parts and Gear Co., Charlotte, N. C., will take over the management of Standardized Parts Corporation about June 15.

Nichrome for Pacific Coast

A representative stock of high nickel content alloys in various shapes and sizes, particularly Nichrome and Nichrome V, is now available for delivery to the Pacific Coast trade, according to an announcement of the Driver-Harris Co., Harrison, N. J. The warehouse is located at 316 Eleventh St., San Francisco, and the Pacific Coast representatives are the Electrical Specialty Co., Ltd. Stocks will be maintained in Los Angeles and Seattle.

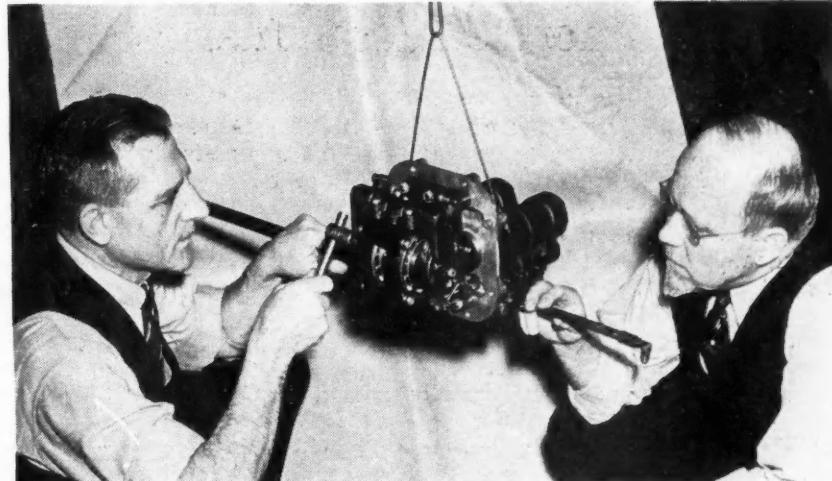
Speculation Aroused by Commission to Study British Trade Acts

President Roosevelt's move to send a commission to Great Britain to study the British Trade Disputes and Trade Union Act has aroused speculation as to whether the Administration, faced with persistent complaints of a defective labor relations law, is moving indirectly to bring about revision of the law.

Mr. Roosevelt emphatically denied that the step had anything to do with Wagner Act revision but most observers had difficulty in refraining from connecting the two together; and John L. Lewis, apparently concerned over the report, said in a letter to Secretary of Labor Frances Perkins that the C.I.O. could not sanction such an enterprise and that its representatives would refuse to serve on the board.

There were discussions also as to whether the Administration might be moving to force the two opposing labor factions to put their houses in order or accept a revised labor relations law more closely approaching the British system—a change which would be far less satisfactory to organized labor. Such rumors lacked confirmation, however, since President Roosevelt insisted that the study was being launched to correct what he called a great deal of misinformation in this country concerning the British law.

The President himself has fre-



COME-BACK? Interest in the development of steam cars has never been entirely dead. Above is the latest development in steam engines. It was designed by Erik Delling (right), formerly chief engineer of the Stanley Motor Carriage Co., manufacturers of the once-famous Stanley Steamer, and William Lamken (left), former research engineer for the Stanley Co. Mr. Delling a few years ago developed a steam bus engine.

Financing this latest enterprise, known as Steam Motors, Inc., is Gilbert Stevenson, 24-year-old Yale graduate. No immediate attempt at mass production is

planned, said Mr. Stevenson, however any gasoline auto or truck could be converted into a steam car for \$1,300 to \$1,500.

According to the designers the engine will develop speeds up to 75 m.p.h., run 16 miles per gallon of furnace oil. No gear shift or transmission is needed, they said, and acceleration is governed by a pedal.

The boiler is mounted under the hood and is said to weigh approximately 410 lb., taking up no more room than the conventional gasoline engine. A 25-gallon water tank mounted on the rear of the car is reported to supply enough water for a three to four hundred mile drive.

Hearings on "Six per cent Case" Indefinitely Postponed

Indefinite postponement of Federal Trade Commission hearings on its complaint against the General Motors Corp. and the Ford Motor Co. in the so-called 6 per cent interest case, was agreed upon Monday by counsel for both sides. Like proceedings which had been instituted against eight other automobile manufacturers and three financing companies were settled by stipulation. They agreed not to resume representations in their advertising as to the amount charged retail purchasers as financing charges under deferred payment plans, which the Commission had alleged to be misleading.

Race Driver Turns to Engine Building

Bowes Racing, Inc., has been formed in Indianapolis by Robert Bowes and Louis Meyer. Meyer is the only three-time winner of the annual 500-mile Indianapolis race. The company will manufacture engines for racing cars. Mr. Bowes is president and Mr. Meyer is general manager and secretary, with Al Jones as vice-president. Operations will begin as soon as a suitable plant can be located. Mr. Bowes, Indianapolis manufacturer, has backed racing cars entered in every Indianapolis race since 1930. He is a part owner of the Bowes Seal Fast Special, which ran in this year's classic.

Automotive Metal Markets

Tin and Copper Output Reduced by Producers

Under the influence of a further cut in production and with plans for the operation of a buffer pool progressing, the price of Straits tin at the beginning of this week stood approximately \$64 a ton higher than during the last week in May. At the beginning of May, Straits tin was offered at 35 cents a pound, without buyers showing much interest; on Monday of this week 38.55 cents was asked. Hardly had the British Colonial Office announced that the Malayan tin producers' referendum regarding the setting up of a buffer stock had resulted in a vote in favor of the proposal, when the International Tin Committee lowered the production quota for the third quarter to 45 per cent of standard tonnages, which compares with a 55 per cent rate in the second quarter and one of 70 per cent during the first quarter of the year. From this curtailed output a certain amount is to be diverted to the buffer stock. At the same time a moderate decline in the world supply was revealed by the May statistics. Considerable tonnages changed hands in London, speculative appetite being whetted by the prospects of still higher prices for the metal. Consumers here were apathetic. The avowed objective of these artificial restrictions of output and the withholding from the market of a certain tonnage besides is to stabilize prices and do away with wide market swings. Consumers, however, know that they always have to pay through the nose for these market manipulations. They were in no position to take on tin when it sold at 35 cents. They are not buying much now that it has gone up \$64 a ton. That they will pay much higher prices, when they really need tin, is quite certain. The London market was closed on Monday because of the Whitsuntide holiday and New York brokers looked for a sharp advance at the resumption of business on Tuesday. While the market kept its upward trend, there was

nothing spectacular about it, spot Straits closing steady on Tuesday at 38 1/2 cents.

Copper producers followed the example of the tin mine owners and slashed production further. One of the large producers, Kennecott Copper Corp., will discontinue operation of all of its domestic mines, beginning the shut down on June 15 and completing it by June 22. Reopening of the properties will depend upon improvement in the demand. Kennecott's decision followed on the heels of that of Anaconda to close down all of its Butte mines, save one. Phelps Dodge Corp., third of the large producers, continues to operate at about one-half of its normal rate. The ensuing shrinkage in the supply of copper has imparted a much steadier undertone to the market. Moreover, renewed demand for copper from those who purvey to the armies of the principal European nations and buying by the Japanese resulted in a sharp advance in the export price for the metal, which brought it near parity with the domestic price of 9 cents.

Further reductions have been made by Detroit producers of secondary aluminum, most of the different grades of alloys being marked 1/4 to 1/2 cent lower.

The situation in the steel market shows little change. Accumulations of small orders permit some of the Middle West finishing mills to operate at a slightly better rate than this week's ingot rate of 26.2 per cent of capacity.—W.C.H.

No Surprise

(Continued from page 772)

and the Chrysler Corp., and their affiliated finance companies, together with 59 executives charged with conspiring to promote monopoly by forcing dealers to finance automobile sales through their affiliated finance companies. The investigations were

started by the Department after independent finance companies complained they were not getting their share of the business.

Hoffman Charges Persecution

Persecution by the Government of General Motors, Chrysler and Ford was charged by Representative Hoffman, Republican of Michigan, in a speech on the House floor last week, in referring to indictments returned against motor officials at South Bend, Ind. The Department of Justice, said Mr. Hoffman, is "persecuting them because they made an attempt to relieve those who were forced to ask credit when purchasing automobiles from the Shylock-like activities of gouging finance companies."

Mr. Hoffman said the present action against the automobile group was taken after the Administration had been unable to put the motor industry in Michigan out of business. He was referring to CIO sitdown strikes, and action against the industry by the National Labor Relations Board.

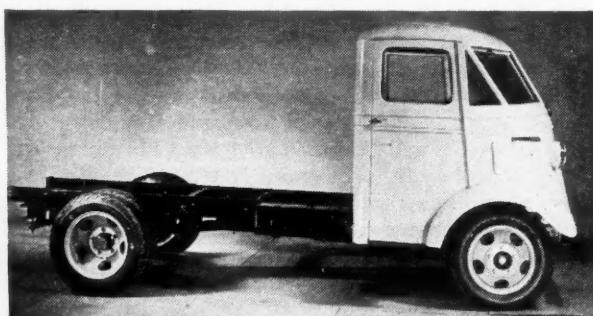
Despite these activities, said Mr. Hoffman, the motor industry continued to carry on. Other Administration "assaults" followed, Mr. Hoffman contended. He mentioned the NLRB order against Ford, and added that Ford was called to the White House, "presumably on the theory that Henry would shrivel and curl in the presence of royalty."

Next, Mr. Hoffman said, "the hounds of the so-called Justice Department were turned loose and now Ford, Chrysler, and General Motors and many of their officials have been indicted." The real complaint, the Michigan Representative said, is that they have failed to bend the knee and bow the head and accept the terms dictated by John L. Lewis and the CIO.

"If Ford, Chrysler and General Motors officials and others who have been indicted because they made it possible to buy cars without paying excessive financing charges, are forced to spend all their time defending themselves they cannot operate their factories," said Mr. Hoffman.

British Engineer Awarded Guggenheim Medal

The Daniel Guggenheim Medal for 1938 has been awarded to A. H. R. Fedden, chief engineer of the Bristol Aeroplane Company of England, "for contributions to the development of air craft engine design and for the specific design of the sleeve valve aircraft engine," it was announced by Maj. Lester D. Gardner, secretary



DODGE'S COE

Continuing the invasion of the low-price field by cab-over-engine trucks, this is the contribution of the Dodge division of Chrysler Corp. for 1 1/2 and 2-ton chassis. Available in four wheelbase lengths, this unit is built by the Montpelier Manufacturing Co.

of the Board of Award. Mr. Fedden is an Honorary Fellow of the Institute of Aeronautical Sciences and a Fellow of the Royal Aeronautical Society, and is regarded as one of the foremost designers of aircraft engines in the world. He is to give a lecture before the Society of Automotive Engineers at White Sulphur Springs on June 13.

Goodyear to Establish Swedish Factory

On his return to Akron, June 7, from his recent European trip, P. W. Litchfield, president of the Goodyear Tire & Rubber Company, confirmed the fact that he had completed plans for establishment of a branch tire factory in Sweden to supply the Scandinavian countries. The new factory will be built at Norrkoping, Sweden, at a cost of \$1,500,000. It will have a capacity of 600 tires and 600 tubes daily and will be in production by fall. A. B. LaDue, Goodyear engineer who accompanied Mr. Litchfield to Sweden, is now there in charge of building plans.

Goodyear now has tire factories in Akron, Ohio; Gadsden, Ala.; Los Angeles, Cal.; and Jackson, Mich., in the United States; at Windsor, New Toronto and Bowmanville in Canada; in Wolverhampton, England; Sydney, Australia; Buenos Aires, Argentina, and Buitenzorg, Java.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

International Exhibition

The first international exhibition of motor vehicles ever held opened in Paris on June 15. All the leading makers of motor vehicles and accessories were represented, and the attendance was large. No English or German firms embraced the opportunity to bring their vehicles before the critical Parisian public, and only one American firm, the Pope Manufacturing Company, whose Columbia carriage was a center of attraction.

The Scotte Company showed several of their heavy steam tractors for both merchandise and passenger haulage.

The Compagnie Generale des Voitures de Paris has on view three styles of electric cabs, which will soon be put in service in the streets of Paris.

From *The Horseless Age*, June 1898.

Motor Worker Earnings Highest Between 45-60

An analysis of payrolls disbursed by automobile manufacturers in the years of full production, revealed that highest annual earnings in the automobile factories are those drawn by men between the ages of 45 and 60.

The earnings reach their peak in the group between 50 and 55 years of age. The average annual earnings of that age bracket in the last period of full production were \$1,680. All groups from 40 to 60, however, showed an average close to or above the \$1,600 mark.

The above information appeared in *Automobile Facts*, a new publication by the Automobile Manufacturers Association. The publication is scheduled to appear monthly, containing monthly reports of factory sales of new passenger cars and trucks.

Ohio Governor Assails Lewis and CIO

Governor Martin L. Davey of Ohio, in a special broadcast, June 6, over a network of Buckeye State radio stations, openly assailed the CIO and John Lewis for the pre-Memorial Day Goodyear riot in Akron and charged that the riot "was deliberately staged by Akron CIO leaders as a surprise movement to take forcible control of the city." He declared that the State's action in having 3600 Ohio National Guardsmen ready for quick entry into Akron prevented a second riot on May 31.

Governor Davey directly assailed John Lewis, saying:

"I make the specific and grave charge that John L. Lewis is one of the big causes for the present depression with its serious unemployment, its misery and its heartaches. He is responsible for industrial turmoil and fear and uncertainty. The millions he has collected in dues are as nothing compared to the millions of jobs he has destroyed. Lewis and the CIO not only have attracted the communistic element, but have welcomed them to their bosoms. It is amazing how many active Communists are high in the command of the CIO throughout the nation."

Governor Davey charged that Communist terrorists were unusually strong and active in Akron. Continuing he said:

"The audacity of these Akron CIO leaders was shown in their demands between the first riot and one which they were planning the next Tues-

day morning. They demanded the forcible closing of the plants when most of the men wanted to work and when no strike vote had been taken. They demanded that police be removed from that section and that Government abdicate its authority completely to the will of a mob led by CIO officials and Communists.

"They demanded that all laws be suspended, that the police remain away and that their armed mob be permitted to commit any acts of violence which the power-mad and desperate leaders desired. Never did a more disgraceful proceeding take place in the name of labor than in Akron.

"Why do you suppose these violent Akron CIO leaders and their Communist allies did not stage their proposed second riot? They knew that several thousand troops were ready to move into Akron to preserve law and order, which is the one thing they do not want.

"They knew that these troops would be there within a few hours and that the majesty of the law and the dignity of the State of Ohio would be maintained. They might be able to murder 180 Akron policemen if they were left alone, but they could not maintain lawlessness and riot against the national guard. And so they beat a hasty retreat and came to an agreement."

Governor Davey said that he "cannot speak for the rubber companies, because we have no contact with their officials," but that "the average wages paid in the Akron rubber industry are by far the highest wages paid in any industry in the United States."

Governor Davey further said, "It is an astounding fact that the CIO has driven more than 15,000 jobs out of Akron because of the intolerable conditions which it has maintained."

International Management Congress

Among the topics assigned to American speakers and representatives of foreign countries at the seventh International Management Congress, to be held in Washington, Sept. 19-23, are "Management's Responsibilities to Society," "The Continuance of Free Enterprise," "Common Ground for Labor and Management," "Labor's Aims and Responsibilities," and "The Public's Concern in Industrial Harmony."

Representatives from 40 countries are expected to attend. Previous congresses have been held in Prague, Brussels, Rome, Paris, Amsterdam and London.

Business in Brief

Written by the Guaranty Trust Co., New York

The decline in general business activity continued last week, with the trends of most lines downward. Opinions in the major industries regarding the outlook during the next few months are not very optimistic. The business index compiled by the "Journal of Commerce" stood at 68.9 last week, as compared with 69.5 the week before and 105.7 a year ago. Declines were registered by petroleum runs-to-stills, steel production, and automotive activity. The volume of retail trade was 3 to 8 per cent above that in the preceding week, but most of the rise is attributed to the greater movement of seasonal goods. The level of buying, however, was from 10 to 18 per cent below that a year ago.

Railway freight loadings during the week ended May 28 totaled 562,061 cars, which marks a gain of 16,253 cars above those in the preceding week, a decline of 228,442 cars below those a year ago, and a reduction of 84,751 cars below those two years ago.

Production of electricity by the electric light and power industry in the United States during the week ended May 28 was 10.6 per cent below that in the corresponding period last year. Output during the week ended May 21 was 10.5 per cent below that a year ago.

Employment in the non-agricultural industries during April showed

a small seasonal increase amounting to about 70,000, according to the Bureau of Labor Statistics. Employment in retail trade and construction activity rose seasonally, offsetting marked declines in factory and mining employment. The usual seasonal rise in employment during April amounts to about 400,000.

According to a recent estimate by the Bureau of Agricultural Economics, gross farm income, including Government payments, during 1937 aggregated more than \$10,000,000,000. This marks the first time in eight years that the figure has exceeded that level. The total for last year was \$10,003,000,000, as compared with \$9,317,000,000 in the preceding year.

Professor Fisher's index of wholesale commodity prices for the week ended June 4 stood at 80.5, as compared with 80.8 the week before.

The consolidated statement of the Federal Reserve banks for the week ended June 1 showed a decline of \$1,000,000 in holdings of discounted bills. Bills bought in the open market and Government securities remained unchanged.

New Bantam Dealers

Thirty-seven new dealers were granted franchises during the month of May, it was announced by A. C. Olander, sales manager of the American Bantam Car Co., Butler, Pa.

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes*

March new car registrations, as indicated below, increased approximately 15 per cent over the February figure for 1938. Dollar volume increased about the same amount. Greatest increase in per cent of total was shown in the class indicated as "Others under \$1,000."

	NEW REGISTRATIONS			ESTIMATED DOLLAR VOLUME		
	March	Three Months		March	Three Months	
		Units	Per Cent of Total		Dollar Volume	Per Cent of Total
Chevrolet, Ford and Plymouth.	102,584	258,993	59.60	\$77,300,000	\$194,800,000	51.59
Others under \$1000	40,308	97,446	22.42	36,900,000	89,000,000	23.57
\$1001-\$1500	29,735	72,572	16.72	33,100,000	81,600,000	21.61
\$1501-\$2000	1,372	3,298	.76	2,400,000	5,700,000	1.51
\$2001-\$3000	642	1,840	.42	1,700,000	4,900,000	1.30
\$3001 and over	90	330	.08	400,000	1,600,000	.42
Total	174,731	434,579	100.00	\$151,800,000	\$377,600,000	100.00
Miscellaneous	187	393				
Total	174,918	434,972				

*All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes. Data do not include returns from Wisconsin.

June 11, 1938

FTC Report on Farm Machinery Industry

The Federal Trade Commission turned over to Congress on June 6 a 1000-page report on its two-year investigation of the agricultural implement and machinery industry, complaining that the bulk of production is concentrated in the hands of a relatively small number of manufacturers. It deferred its recommendations for remedial action to a later date at which time the second part of its study dealing with prices, profits, costs and investments will be completed.

The investigation, which cost in the neighborhood of \$150,000, was authorized by Congress on June 24, 1936, after the anti-monopoly bloc had focused attention on a report that farm machinery prices had been maintained at high levels during the depression when farm income dropped from around \$5,000,000,000 in 1929 to \$1,500,000,000 in 1932. The FTC completed a similar survey in 1920 on the "Causes of High Prices of Farm Implements" and charged that manufacturers were attempting to "cooperatively control or restrict competition and enhance prices."

These older, cruder and "more obviously illegal agreements" have been substituted, the Commission said in its report, by present practices of following price leaders in the industry, exchanging information on prices and specifications and standardizing design and construction. The Commission cited International Harvester Co., Chicago, and Deere & Co., Moline, Ill., as the industry's "price leaders" but said that concentration of control is largely in the hands of eight large, long-line companies and greatest in the manufacture of harvesting machines, tractors and the latest type of tractor-operated machines.

Other companies included in the group are J. I. Case Co., Racine, Wis.; Allis-Chalmers Mfg. Co., Milwaukee; Oliver Farm Equipment Co., Chicago; Minneapolis-Moline Power Implement Co., Minneapolis; The Massey-Harris Co., Inc., Racine, Wis.; and B. F. Avery & Sons Co., Louisville, Ky.

The FTC, in illustrating "the primary importance" of farm income in relation to the industry, emphasized that farm implement production decreased from \$607,000,000 in 1929 to \$95,000,000 in 1932 as a result of a drastic drop in agricultural income. It also reminded Congress that 1936 and 1937 were the most prosperous years for farm machinery manufacturers since the World War.

Automotive Industries

URW Stops "Wildcat" Strikes

Tire Plants to Operate at Low Ebb During Employe Vacations

As a result of the recent outlaw strikes at the Goodyear and Goodrich factories in Akron, the former resulting in a riot in which 100 were injured, international officers of the United Rubber Workers of America in an emergency session in Akron, have "clamped down the lid" on unlawful and unauthorized stoppages of work. Officials declared that in neither the Goodyear strike nor the Goodrich strike were international officers called in for official sanction, and union rules governing strikes were violated. This statement was made by Frank Grillo, URW secretary-treasurer, who was publicly charged by Mayor L. D. Schroy with inciting riot and rebellion during the Goodyear riot.

"Proper discipline, without suppressing the initiative and militancy of the membership, is necessary if the union is to grow," Grillo declared.

The URW constitution provides that before a strike can be called, representatives of the international union must be called in and a special membership meeting must be held to take a strike vote.

The Goodrich strike started when electricians pulled switches, cutting off all power and light and rendering the entire Goodrich factories idle. Picket lines were then set up. The Goodyear strike started when unionists tried to prevent shipments of tires to leave the factories.

Firestone Tire & Rubber Company factory employees whose service records entitle them to one or two week vacations, will take their vacations between June 20 and July 5, according to L. S. Buckmaster, president of the Firestone local of the United Rubber Workers. Employees with service records of 10 years or more get two weeks vacations with pay. Employees with five or more years' service, but less than ten, will get one week each.

B. F. Goodrich Company employees will take their vacations June 29 to July 6. Under the recent URW-Goodrich contract, men with five years of service or more, with get 1 per cent of their 1937 pay. Employees with 10 years' service will get 2 per cent of their 1937 pay. These figures represent half of the vacation pay given Goodrich employees last year.

The vacation periods will affect several thousand employees in each company and will mean that the tire plants will operate at low ebb.

At Goodyear, the URW still continues to negotiate in the direction of a contract. The subject of vacation pay probably will be covered in whatever proposed signed contract is submitted to the management for approval.

Reorganization of German Piston Corporation

The Elektronmetall G.m.b.H., Bad Cannstatt, which manufactures Nelson Bohnalite pistons in Germany, as well as pressure die castings and aircraft landing gears, has been converted into a new form of corpora-

tion known as a "Kommandit Gesellschaft" and will hereafter operate under the style of Mahle Komm.-Ges.

Elektronmetall G.m.b.H. was originally organized to create an industrial market for Elektron, a brand of magnesium alloys, which are produced by the Elektron Works of Griesheim, a subsidiary of the I. G. Farben A. G., the German dye trust.

At the outset it produced piston and other castings of magnesium alloys, but when these pistons did not show the life required in commercial applications, the firm switched to aluminum and acquired the Nelson Bohnalite rights for Germany. It has done a great deal of development work of its own, and its light-alloy pistons are in extensive use in Germany.

World Production of Motor Vehicles

For the fifth successive year, the world production of motor vehicles continued its upward trend with the result that the output for 1937 registered a new high with a total of 6,352,525 units, according to the report of the Department of Commerce. Production for 1936, the report stated, was 5,799,502 units. The total world production for 1937 was indicated as being 6,350,264 in the Feb. 26 Statistical Issue of AUTOMOTIVE INDUSTRIES.

Japanese production increased from 9632 in 1936 to 14,430 in 1937. Percentage of production exported dropped from 41.5 to 22.9 for the same period. As the industry is controlled by the army, and in present conditions no definite figures were available, estimates were used.

Figures for total Japanese imports for 1937 were not available. However, imports of cars manufac-

tured in the U. S. increased from 15,735 to 16,684.

Per cent of Germany's production exported increased from 12.1 in 1936 to 20.5 in 1937. Exports from Germany to Great Britain increased from 484 in 1936 to 5632 in 1937, giving credence to the statement made by Lord Percival Perry, chairman of Ford Motor Co., Ltd., as reported in AUTOMOTIVE INDUSTRIES issue of May 14.

Sweden apparently decreased its consumption of Swedish built cars in 1937. Its imports increased from 14,826 in 1936 to 22,755 last year, and at the same time the percentage of production exported increased from 59.2 to 66.6.

Nearly 600,000 four-cylinder cars were built throughout the world, outside of this country, in 1937—about three times as many as the United States produced.

COUNTRY	1936			1937		
	Passenger Cars	Trucks and Buses	Total	Passenger Cars	Trucks and Buses	Total
United States	3,699,528	784,587	4,454,115	3,915,889	893,085	4,808,974
Canada	128,369	33,790	162,159	152,631	54,369	207,000
Total	3,797,897	818,377	4,616,274	4,068,520	947,454	5,015,974
Austria	4,496	809	5,275	4,820	1,223	6,043
Belgium	80	474	534	1,750	633	2,383
Czechoslovakia	11,158	993	12,141	12,186	1,627	13,813
Denmark	250	250	250	250	250	250
Finland	200	200	200	144	144	144
France	178,354	23,383	201,737	176,959	24,976	201,934
Germany	242,292	57,220	297,512	287,652	64,242	331,894
Hungary	485	485	485	129	495	615
Italy	39,000	4,600	43,600*	66,000†	40	66,000
Japan	3,460	6,172	9,632	5,150	9,280	14,430
Netherlands	1,230	1,200	2,400	1,500	40	40
Poland	1,230	1,200	2,400	1,500	700	2,200
Spain	x	x	x	x	x	x
Sweden	875	3,576	4,451	1,796	4,830	6,626
Switzerland	6	290	296	690	690	690
United Kingdom	354,285	112,050	466,335	377,597	112,769	490,366
U. S. S. R.	9,900	128,500	138,400	18,176	180,947	199,123
Total	843,056	349,172	1,183,228	933,705	402,846	1,336,551
Grand Total	4,640,953	1,158,549	5,799,502	5,002,225	1,350,300	6,352,525

* Revised.

† Includes trucks and buses.

x - Not available.

Production

(Continued from page 771)

trucks during May, which is the figure released this week by the Automobile Manufacturers Association as its preliminary estimate.

Several manufacturers have reported increases in sales by their dealer organizations during the latter part of May. Hudson distributors in Cincinnati, Dallas, Des Moines, Milwaukee, San Francisco, and Seattle reported increases ranging from 21 to 95 per cent with other centers showing lesser but welcome improvement. These reports lend strength to previous statements that the major producers will continue to turn out cars during the summer months so long as demand is sufficient to warrant continued operation.

Graham reentered the production picture this week and expected to see between 350 and 400 cars come off the final assembly line. General Motors divisions expected to produce close to 16,000 cars and trucks with Ford production estimated at 9500, and that of the Chrysler units at 8500.—J.A.L.

Ford Seeks to Carry NLRB

Contest to Highest Court

The Ford Motor Co. on Wednesday notified the Sixth Federal Circuit Court of Appeals of its intention to carry to the Supreme Court its contest of a National Labor Relations Board order seeking to require the company's compliance with the Wagner Act.

The original board order was issued Dec. 22 and sought to require reinstatement of 29 workers in Ford's Michigan plants.

More Machinery—More Jobs

Use of constantly improved machinery by automobile manufacturers has resulted in no technological displacement whatever of labor in the aggregate, J. H. Van Deventer, editor of *The Iron Age*, told the Economic Club at the Book-Cadillac Hotel, Detroit, Monday. Instead, he said, better machinery has actually made more jobs and the automotive industry, most highly mechanized in the world, has done more than its share to reduce unemployment.

Offering hitherto unpublished figures obtained in a broad employment survey of the industry as a conclusive answer to frequent claims that the machine is largely responsible for the depression, Mr. Van Deventer urged industry generally

to explore the automotive industry's accomplishments.

Records of the United States Census and Labor Statistics Bureaus show, the editor said, the astonishing fact that each automobile produced in 1929 provided only 4.3 man-weeks of employment to labor while each car made in 1937 provided 5.6 man-weeks. And from 1929 to 1937 the automobile industry, instead of destroying jobs, created jobs two and one-half times faster than the rate of population increased and definitely proved, he said, the "compatibility of men and machines."

New Aircraft Factory

Safe-Wings, Inc., headed by A. G. Gardner, formerly a designing engineer with Fairbanks, Morse & Co., Beloit, Wis., is establishing an aircraft factory in the plant of the former Pheasant Aircraft Co. at Fond du Lac, Wis., to build low-cost ships at the rate of about five daily and selling in the \$1,500 class for a two-seated plane. A feature of the design, it was stated, is a slotted wing construction making it possible to land the ship at a speed of 18 to 20 m.p.h. and making impossible nose dives or tail spins in landing. An inverted tank type of motor, with four cylinders developing 65 hp., will be used for the present. The firm, it is said, is backed by aviation enthusiasts in Milwaukee, Racine, Beloit, Wis.; Rockford, Ill., and other mid-western cities.

Annual A.S.A.E. Meeting

Two papers of automotive interest are to be presented at the annual meeting of the American Society of Agricultural Engineers, Asilomar, Pacific Grove, Cal., June 27-30. The papers—"Bridging the Gaps," by Leonard J. Fletcher, agricultural engineer and assistant general sales manager, Caterpillar Tractor Co.; and "The Evolution of the Mechanical Cotton Harvester," by E. A. Johnston, vice-president in charge of engineering and patents, International Harvester Co.

Earl L. Ramsey has been appointed to take charge of sales of the Diesel fuel injection equipment division of the Ex-Cell-O Corp. Mr. Ramsey joined the Ex-Cell-O organization in April, 1927, as manager of the Buffalo office. He had previously been works manager of the New Process Gear Co.



E. L. Ramsey

Road Congress

(Continued from page 771)

Highways; J. S. Helm, president, Asphalt Institute; Thomas P. Henry, president, American Automobile Association; F. C. Horner, acting chairman, highways committee, Automobile Manufacturers' Association; Henry G. Shirley, Virginia, highway commissioner; Charles M. Upham, engineer-director, American Road Builders' Association; Murray D. Van Wagoner, president, American Road Builders' Association; and J. Borton Weeks, president, American Motorists' Association.

The International Road Congress was originally called by the Permanent International Association of Road Congresses for the purpose of exchanging views on world progress in road building, traffic control, and highway utilization. The road congress has met every four years over a long period of time but was suspended temporarily during the World War. It is recognized by highway authorities in this country as a major stimulant in the development of highways throughout the world.

A.S.M.E. to Meet In St. Louis

The semi-annual meeting of the American Society of Mechanical Engineers is scheduled to be held in St. Louis with technical sessions beginning Monday evening, June 20, and continuing through Thursday morning.

Papers to be presented of automotive interest are "The Manufacture of High-Speed Tanks," by Maj. John K. Christmas; "Report on Standardization Roughness Measurements," by J. R. Weaver; "Scope and Limitation of the Projection Method for Shop Measurement," by Henry F. Kurtz; and "Surface-Finish Measurements," by E. J. Abbott.

Car Manufacturers File Views On Trade Practice Conference

Stating that "We offer our comment solely for such illumination of the problems involved as our experience has produced, especially as the matters at issue affect or may affect buyer interest," the Automobile Manufacturers Association sent to G. S. Ferguson, chairman of the Trade Practice Conference, detailed comment on the proposed trade practice rules adopted at the automobile dealers' meeting in Detroit, April 26.

The letter to the Federal Trade Commission stated that most of the proposed rules should prove beneficial. Opposition of the association

to price fixing was stated with the warning that regulation limits earnings. Over-allowance on used cars was termed in the letter as being demoralizing.

First Quarter Tire Figures

Tire and tube excise taxes paid in the first four months of 1938 were only 55 per cent of the taxes paid in the corresponding period of 1937. The tax on tires for the first quarter of this year was \$3,933,700 compared with \$8,418,000 in 1937; and \$6,154,300 in 1936. The tube tax was \$891,200 this year against \$1,661,300 in 1937 and \$1,237,000 in 1936.

Employment in the rubber industry for April was down 24.8 per cent from the April figure of a year ago. Payrolls were down 38.7 per cent.

The manufactured sales value of rubber goods in the first quarter was \$103,804,000 or 38.5 per cent less than the \$168,902,000 reported for the first quarter of 1937. The figure for the first quarter of 1936 was \$119,054,000.

Total tire shipments for the first quarter were 47 per cent under those for the first quarter of 1937 and 29.5 per cent under the first quarter of 1936. The dollar volume did not show as steep a drop, due to the 1937 price increases.

Replacement sales are holding to normal seasonal trends, but original equipment orders are extremely low. The four major companies which supply this market—Goodyear, Goodrich, Firestone and United States, look for not to exceed 10,500,000 original equipment deliveries for all of 1938, compared with 22,700,000 in 1937. Ford's production of 4,000 tires daily will cut heavily into the original equipment business of the tire industry.

Bruce W. Huling

Bruce W. Huling, 61, assistant manager of accessory sales and former service manager of the B. F. Goodrich Company, died in Akron, June 2. He had been with the company 28 years and had served as general manager of Goodrich operations in Argentina and Johannesburg, South Africa.

Wheel and Rim Association Has New Offices

Offices of the National Wheel and Rim Association, Inc., have been moved from 63 W. Milwaukee Ave., Detroit, Mich., to 606 Stephenson Bldg., same city, where Edward S. Ingham is secretary and general manager.

Labor

(Continued from page 771)

voluntary on the part of members and collections would be made by the union instead of by the employer with the union getting the benefit of any commissions.

Although no umpire ever was selected to arbitrate differences between General Motors and the UAW over interpretation of preferred lists of employees, it is understood that negotiations have proceeded satisfactorily with little possibility of further disagreement at the present time.

The recent pitched battle between police and CIO pickets at the American Brass Co. plant has lead Mayor Richard Reading of Detroit to recommend formation of an industrial peace board in Detroit, similar to that which appears to have operated effectively in Toledo. Mayor Reading's proposal calls for a 24-man board with six representatives each from labor, management, investors and consumers. The proposal has been attacked by Homer Martin on the ground that there is no difference in the economic or social viewpoint of management and investors, and that everyone is a consumer so that in effect the board would be loaded against labor. He also opposed the Mayor's proposal that the labor representation would include representatives of independent unions on the ground that these are company unions.

Congress Approves Highway Aid Conference Report

Both Houses of Congress have voted to accept the conference report on the Federal highway-aid measure, paring the original House bill from \$484,000,000 to \$357,500,000 for both the fiscal years 1940 and 1941.

Although the action reduced the proposed House appropriation by \$126,500,000 the approved bill assures the continuation of Federal aid at the rate of \$158,500,000 in 1940 and \$191,000,000 in 1941. It has averaged about \$238,000,000 for the years 1937 and 1938 and President Roosevelt asked Congress last November to reduce highway aid appropriations to around \$100,000,000 a year—the rate prevailing prior to 1933.

House conferees agreed to the reduction after the Bureau of Public Roads estimated it will have a \$150,000,000 balance on hand next January. Provision in the pending relief-recovery bill carrying \$150,000,

000 for farm-to-market roads also was a contributing factor.

Representative Mott, Republican of Oregon, and Representative Warren, Democrat of North Carolina, were among those opposing the reduction. Arguing along the lines followed by other Congressional members ever since curtailed highway-aid was first discussed, they characterized the reduction as a threat to State programs planned in anticipation of continuing Federal grants.

As approved the measure calls for Federal highway aid expenditures for 1940 and 1941, respectively, as follows: Primary roads, \$100,000,000 and \$115,000,000; secondary roads, \$15,000,000 and \$15,000,000; grade crossing elimination, \$20,000,000 and \$30,000,000; forest roads, \$10,000,000 and \$13,000,000; public land roads, \$1,000,000 and \$2,000,000; national park roads, \$4,000,000 and \$5,000,000; national parkways, \$6,000,000 and \$8,000,000; Indian roads, \$2,500,000 and \$3,000,000.

In addition \$8,000,000 was appropriated for an emergency relief fund for repairing highways and bridges damaged by floods or hurricanes.

States which will receive close to \$4,000,000 or more of regular Federal-aid funds for each of the years 1940 and 1941 include, California, Illinois, New York, Ohio and Pennsylvania. Texas' allocation will total slightly more than \$6,000,000 in 1940 and in excess of \$7,000,000 in 1941. Delaware, New Hampshire, Rhode Island and the District of Columbia will receive the least. Each will get \$487,000 in 1940 and \$560,000 in 1941.

Grumman Wins Plane Contract

Approval of a \$1,412,916 contract for the procurement of 26 short-range amphibian airplanes, Grumman Model G-31, with spare parts, from Grumman Aircraft Engineering Corp., has been announced by Acting Secretary of War Louis Johnson.

The Grumman Model G-31 is powered with two Pratt & Whitney Wasp, Jr., engines and has a top speed of more than 185 m.p.h. and a cruising speed in excess of 140 m.p.h., with a landing speed of about 70 m.p.h. It will carry a crew of two and four passengers.

Traffic Research Bureau

The Bureau for Street Traffic Research has moved its headquarters from 29 Holyoke Street, Cambridge, Mass., to Yale University, 315 Strathcona Hall, New Haven, Conn.

Hudson Sales Rise Sharply

Sales of Hudson automobiles for the week ended May 28 showed a gain as compared with the previous week. Increases were particularly notable in the more heavily populated eastern and midwestern sections of the country resulting in the substantial improvement.

Among the gains registered for the week as compared with the previous seven-day period the following are noteworthy: New York—10 per cent; Philadelphia—17 per cent; Cleveland—120 per cent; Cincinnati—25 per cent; Denver—90 per cent; Kansas City—45 per cent; Minneapolis—60 per cent; Pittsburgh—108 per cent; St. Louis—80 per cent; Seattle—27 per cent; Syracuse—110 per cent, and Youngstown—75 per cent.



A. J. JENNINGS has been appointed general sales manager of the Cleveland Worm and Gear Co. and of its affiliate, the Farval Corp. Assisting Mr. Jennings will be **S. L. EASTMAN** and **C. R. BURELL**.

JOSEPH H. CARTER has been elected a director and vice-president of the Pittsburgh Steel Co. in charge of operations. For the past two years he has been general superintendent of the company's plants.

First step toward the organization of a separate division at Graham-Paige Motors Corp. to handle the Graham-Bradley tractor was taken when **E. J. HARRINGTON** was appointed sales manager of the tractor division. **E. A. POLHAUS** was named as assistant to Mr. Harrington.

V. P. RUMELY, formerly of Hudson Motor Car Co., has been appointed works manager of the Crane Co., Chicago works. Mr. Rumely is past chairman of the Detroit section S.A.E.

HARRY W. HOLT, vice-president and sales manager of the Bohn Aluminum and Brass Corp., has resigned as an active executive of that company. He continues as a director.

Magnus Chemical Co. announces the appointment of **CARL GEYER** as sales representative in Ohio and W. Va., **RALPH NEEDLY** as resident sales representative in California, and **CARL STEINBERG** as representative in sections of Penna.

P. E. TOBIN, formerly B. F. Goodrich Co. sales supervisor in the Cincinnati district, is now a member of the company's manufacturer's sales department.

MacGowan Appointment

U. S. District Judge Thomas W. Slick, Fort Wayne, has granted the petitions of Auburn Automobile Co., and Lycoming Manufacturing Co., to appoint John K. MacGowan general manager and chairman of the board of both corporations at a monthly salary of \$600 from each. The appointment is subject to further court order.

June 11, 1938

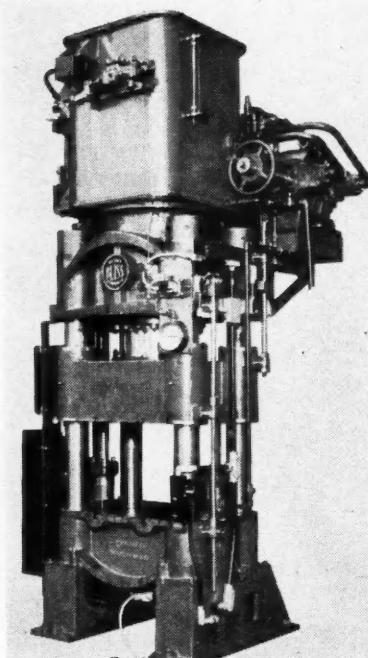


350-Ton Press

... New Bliss machine of open rod type with a moving down slide; maximum stroke 12 in.

A new 350-ton capacity "Hydro-Dynamic" single-action press was recently announced by The E. W. Bliss Co., Brooklyn, N. Y. It is of the open rod type with a moving down slide, the slide being guided on all four rods by removable bronze bushings.

Maximum stroke of the press is 12 in. but, by a simple adjustment on the press control, any desired stroke below 12 in. can be obtained in any part of the full stroke travel. The slide has a high-speed approach to the work and changes automatically to the pressing speed. This speed change can be made just before the work is contacted, or by a simple manipulation of the control the change of speed can be delayed until after the work is contacted and pressure starts to be exerted. The press will continue its pressing speed until a selected pressure is obtained after



350-Ton "Hydro-Dynamic" single action Bliss press.

which it will automatically reverse and return to the starting position at high speed. If desired, the automatic reversal can be obtained after

the slide has travelled a given distance instead of after attaining a given pressure. Selection of one method or the other is by means of a simple adjustment of the control rods of the press.

The press is very rapid in action, being equipped with an oversized prefill valve of the normally open balanced quick acting type, making it possible to obtain as high as 40 to 45 strokes a minute when operating on a short stroke.

The control of the press is electrical throughout for both production operation and inching control. It is possible to move the press slide at increments as small as 1/16 to one inch when on inching control.

The bed and slide areas are 30 in. sq.; the shut height is 15 in.; the overall height is slightly over 12 ft.; the weight is about 18,000 lb.; and a 30 hp. 850 r.p.m. motor is required.

Electronic Micrometer

... New instrument by Instrument Specialties Co. measures to within 0.00005 in.

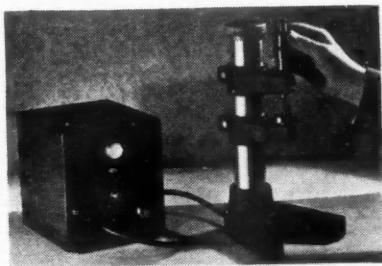
Measurement of dimensions to within 0.00005 in. (half-a-tenth) with no contact pressure and no human element in setting are features of the new Carson electronic micrometer, made by Instrument Specialties Co., Little Falls, N. J. The complete instrument consists of a sturdy stand and column supporting an adjustable work table and a micrometer head. Electrical connections from the stand are plugged into a small cabinet containing the electronic unit. On the front of the cabinet, a bulls-eye lens glows at the first instant of metal-to-metal contact between a sharp micrometer point and the work being measured.

The maker points out that, because of the special electronic circuit employed, the sharp micrometer point does not pit or mar the surface being measured. Positive indication of contact is given before the sharp point penetrates the surface. With a large diameter drum on the micrometer head, direct readings to closer than 0.00005 are quickly and positively obtained.

In addition to its use for accurate measurements of usual work in the shop, inspection department and tool

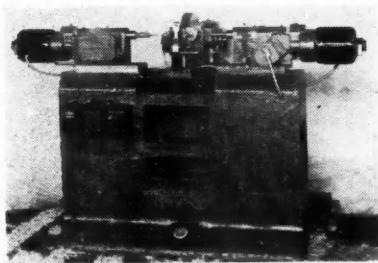
Automotive Industries

room, the Carson electronic micrometer is said to provide a low-cost method of precisely measuring the free length, and length under load, of coil or flat springs without the



Carson electronic micrometer

measuring operation itself placing any load on the springs. Measurements can be made against highly polished surfaces, ball bearings and races, gages and mirror surfaces without marring the work. Soft and ductile materials such as copper or aluminum can be accurately gaged without deforming the metal. Dimensions of thin ribbon, fine wire, foil and small parts such as used in watches and instruments are easily and precisely measured. Non-conducting materials are readily handled by measuring against a steel plate placed over the work.



Horizontal three-way drilling and reaming machine which was recently designed and built by the Langelier Mfg. Co., Providence, R. I., for drilling and reaming brass castings.

The fixture is hand operated for loading and clamping, and the three heads are interconnected electrically. Tripping is done by closing a foot switch.

Carboly tools are used to drill and counterbore in one operation. Production rate is 450 per hr.

Frame Contracts at 1937 Level

The usual annual contracts between automobile manufacturers and the A. O. Smith Corp., Milwaukee, for frames for 1939 models indicate that commitments are at approximately the same level as for 1938 models, but production this fall will not be started off at the high levels which prevailed in the fall of 1937, it was stated.

While hopeful of higher produc-

tion this fall and next spring than was experienced this season, the new contracts are seen as indicating that automobile factories will make an effort to spread 1939 demands over several months rather than having the sharp peaks in the 1937-38 season. Shipments of frames for 1938 cars are due to end late in July, with first large deliveries of 1939 frames scheduled to begin around Aug. 1.

Calendar of Coming Events

CONVENTIONS AND MEETINGS

SAE Summer Meeting, White Sulphur Springs, W. Va.	June 12-17
Major Committees and board of directors of National Standard Parts Association, Detroit, Mich.	June 21-24
American Society for Testing Materials Meeting, Atlantic City, N. J.,	June 27-July 1
National Petroleum Association Meeting, Atlantic City, N. J.	Sept. 14-16
Seventh International Management Congress, Washington	Sept. 19-23
SAE National Regional Fuel and Lubricants Meeting, Tulsa, Okla.	Oct. 6-7
SAE National Aircraft Production Meeting, Los Angeles, Calif.	Oct. 13-15
American Welding Society Meeting, Detroit	Oct. 17-21
SAE Annual Dinner, New York	Nov. 14
SAE National Transportation Engineering Meeting, Commodore Hotel, New York	Nov. 14-16
National Safety Council Meeting, Chicago	Nov. 14-18
American Petroleum Institute Meeting, Chicago	Nov. 14-18
National Industrial Traffic League Meeting, New York	Nov. 17-18
SAE National Production Meeting, Chicago	Nov. 30-Dec. 2
Automotive Service Industries Show, Chicago	Dec. 5-10
*National Standard Parts Association Meeting, Chicago	Dec. 2-3

SHOWS

New York, National Motor Truck Show, Nov. 11-17
New York, National Automobile Show, Nov. 11-18
Pittsburgh, Pa., Automobile Show, Nov. 11-18
Detroit, Mich., Automobile Show, Nov. 11-19
Columbus, Ohio, Automobile Show, Nov. 12-18
Buffalo, N. Y., Automobile Show, Nov. 12-19
Chicago, Ill., Automobile Show, Nov. 12-19
Milwaukee, Wis., Automobile Show, Nov. 12-19
Minneapolis, Minn., Automobile Show, Nov. 12-19
*Philadelphia, Pa., Automobile Show, Nov. 12-19
*San Francisco, Calif., Automobile Show, Nov. 12-19
Los Angeles, Calif., Automobile Show, Nov. 12-20
*Elmira, N. Y., Automobile Show, Nov. 14-19
New Haven, Conn., Automobile Show, Nov. 14-19
Baltimore, Md., Automobile Show, Nov. 19-26
*Washington, D. C., Automobile Show, Nov. 19-26
*Cincinnati, Ohio, Automobile Show, Nov. 20-26
*St. Louis, Mo., Automobile Show, Nov. 20-27
Newark, N. J., Automobile Show, Nov. 26-Dec. 3
Denver, Colo., Automobile Show, Dec. 5-10

*Tentative



Additions to the Torrington Mfg. Co.'s line of Aristocrat air circulator fan blades is the subject of bulletin No. 1538 released by that company. The bulletin describes 20 and 24-inch air circulator blades.*

Earth moving in all parts of the world and under all types of climatic and soil conditions is illustrated and explained in a new booklet issued by Caterpillar Tractor Co.*

A booklet, "Bus Facts for 1938", giving facts and figures on the motor bus industry as of Jan. 1, 1938, has been published by the National Association of Motor Bus Operators.*

Lemco Products, Inc., has released an illustrated folder with information on its line of brake drum truing machines, brake drum grinders, presses, grinders and boring machines.*

A four-page bulletin, No. 513, has been issued by the Bristol Co., covering its pneumatic telemetering system for recording and automatically controlling temperature, flow, pressure, and liquid level.*

The Texas Co. has published its June issue of "Lubrication" which deals with Diesel tractor lubrication.*

Bulletin No. 322 of the Chain Belt Co. illustrates and describes the complete line of construction equipment which that company manufactures for the contracting industry.*

Brick and concrete restoration is the subject of a booklet released by the Trucon Laboratories, formulators and manufacturers of waterproofings and technical coatings.*

Two new catalogs on the subject of sand conditioning, as handled by the Sandcutter method, have been published by the American Foundry Equipment Co.*

A new bulletin, No. 38-A, has been published by the Electric Air Heater Co., division of the American Foundry Equipment Co., on its line of Electromode electric unit heaters for commercial and industrial use.*

"How to Run a Lathe," the machinist's manual in a new 34th edition, has been announced by the South Bend Lathe Works. Copies are 25 cents each.*

The Manhattan Rubber Mfg. division of Raybestos-Manhattan Inc. is distributing a bulletin, No. 6869, describing construction and applications of its Condor whipcord endless belt.*

The Niagara Machine and Tool Works has released a folder covering its line of shears, presses and seamers.*

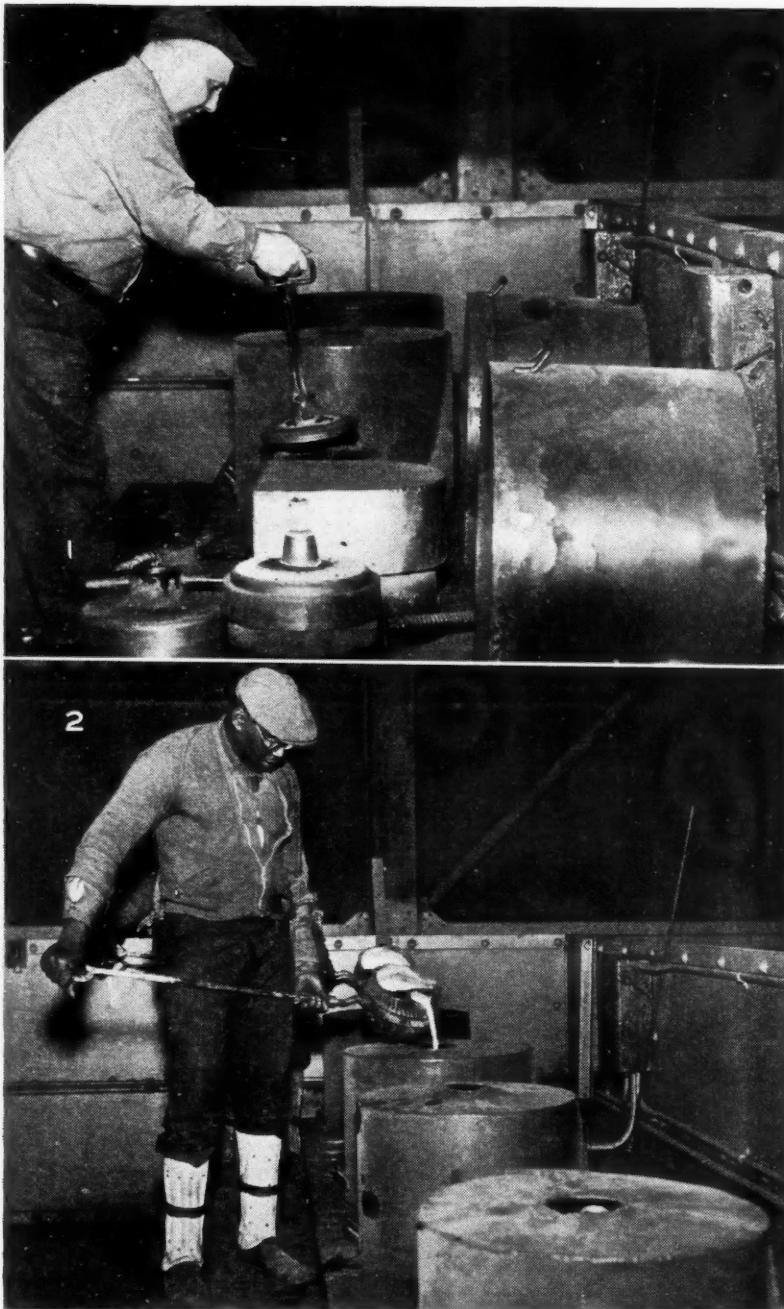
Portable and stationary pneumatic riveters are described in a bulletin released by the Hannifin Manufacturing Co.*

*Obtainable from the editorial department AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Parts Outlook Unfavorable

Only the most favorable situated automobile parts manufacturers were able to operate at a profit in the first quarter 1938, according to market opinion. It was stated that a total of 41 companies suffered aggregate losses of \$2,500,000 as compared with a profit of \$22,000,000 for the first quarter of 1937.

Outlook for the remainder of the year was stated as being decidedly unfavorable.



1 View of centrifugal casting machine with cover open, finished ring gear blank in place. Note that the gear blank machines all spin on vertical axis

2 Pouring alloy steel mixture in battery of experimental centrifugal casting machines. The metal is prepared in a small electric furnace within easy reach of this station

FURTHER extension of the art of steel casting as developed by the Ford Motor Company has resulted in a large scale experimental program of centrifugal casting of typical parts which replace highly-stressed steel forgings. First fruits have been the experimental production of centrifugally cast steel rear axle ring gears and transmission cluster gears.

As in the case of many Ford projects, chief reason for extensive work in this direction has been the desire to achieve production economy by reducing waste of raw materials as well as total volume of raw materials handled by comparison with a given tonnage of finished parts. This objective has been completely realized since it is possible to produce accurately formed parts with the very

Ford Motor

minimum of excess material for the finishing cuts in the machine shop operations. As a matter of fact, the weight of the finished spun gears is somewhat less than that of forged gears due to the accuracy of the process and the ability to core and produce undercuts.

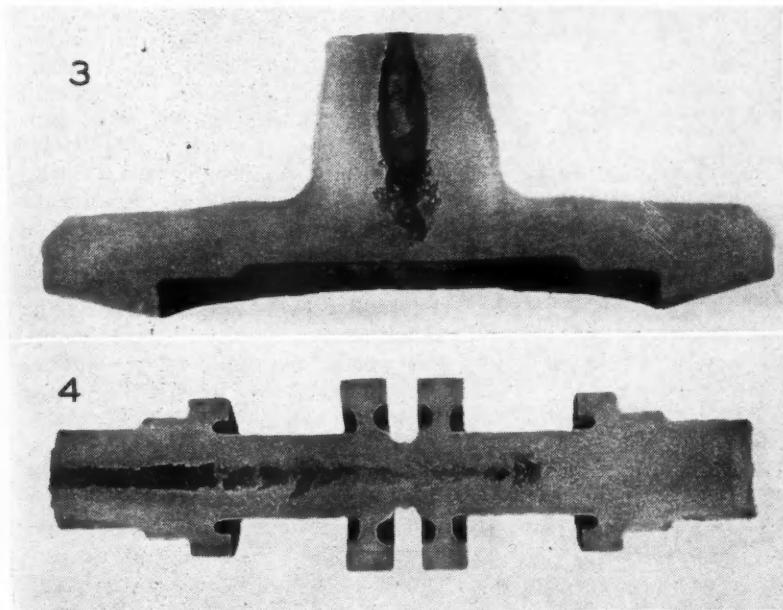
Although economy is an objective, no shortcoming in quality or life of these important parts has been tolerated. According to R. H. McCarroll, centrifuging insures a sound casting, free of blow holes and shrinks. But still more important, any remaining crystal structure in the metal runs perpendicular to the forces to which gear teeth will be subjected in actual use. In a forging, on the other hand, the "flow lines" formed during forging are parallel to the lines of force.

Centrifugally cast gears have been submitted to rigid controls to assure life and serviceability. Three tests have been applied as criteria—conventional static tooth loading, impact, and accelerated life tests of complete transmissions. As a result of the laboratory test work, Mr. McCarroll tells us that the cast steel gears are "at least equal to forged gears in every respect."

Cast gears are being made of alloys of the same general nature as those used for the forgings and are subjected to the same heat treatment, slightly modified. Ring gears, for example, are cast in a composition very much like SAE 5140 steel except for the addition of copper, a small addition of aluminum, and somewhat closer tolerance on carbon and alloys. The castings are normalized at 1700-1750 deg. Fahr., the same as the forgings except that the castings are cooled a little faster to insure a Brinell that is not too soft, the desirable machinable hardness being 190.

It is of interest to note, from a metallurgical point of view, that the new process produces an extremely fine grained structure—ranging from 5 to 7—and, moreover, grain size can be accurately controlled

Develops Centrifugal Steel Casting



3 Cross-section of typical centrifugally-cast alloy steel ring gear

4 Typical cross-section of centrifugally-cast alloy steel transmission cluster gear

without difficulty. Another noteworthy point is that the fine grain size is developed invariable in the "as cast" condition.

While Ford metallurgists are conservative in their claims for the process, striving chiefly for the same properties as developed in forged gears, they point to a number of outstanding features that contribute to the quality of centrifugally cast gears. First is the uniformity in the rate of cooling, second, the rapidity of cooling, and finally, complete freedom from segregation.

As shown in the illustration, the gears are cast in molds set on a vertical axis so that the rotation is in the horizontal plane, as contrasted with the conventional methods of spinning sleeves, for example. It is possible to hold the dimensions much closer than in the case of forgings,

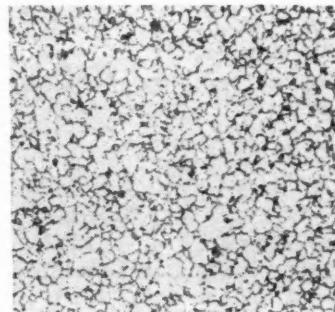
leaving considerably less excess metal to be machined off the gear blank. The only sand cores required are those used where undercuts are desired for reasons of design, and to take care of shrinkage between prominent protruding parts of castings.

The company's experience with casting these parts centrifugally extends back a full year. At first the molds were spun at speeds ranging from 400 r.p.m. to as high as 1800, but 600 r.p.m. for the ring gear blank and 800 for the transmission gear blank have proved the most satisfactory.

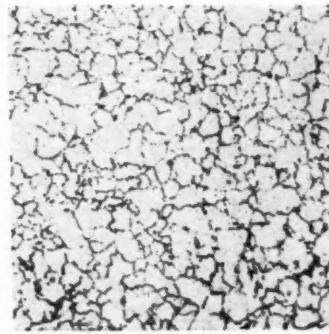
In centrifugal casting the metal is taken directly from the melting furnace to the mold, and approximately three minutes later the gear blank emerges. The simplicity and low cost of this operation is in contrast to the forging method.

At the present time, all gears made in experimental production are being placed in the field in vehicles that are subjected to close control. Experience to date has been so satisfactory that the method promises further expansion and in fact, multiple centrifugal molds are being developed to place the operation on a production basis.

Eventually it is expected that the process will be adapted to the production of many parts, now being forged, which in form are approximately cylindrical and symmetrical about one axis.



Microphotograph of specimen of spun cluster gear, in normalized condition. (Normalized at 1700 deg. Fahr.)
Magnification X100



Typical microphotograph centrifugally-cast cluster gear specimen, "as Cast" condition showing refinement of grain.
Magnification X100

Alfa-Romeo Brings Forth

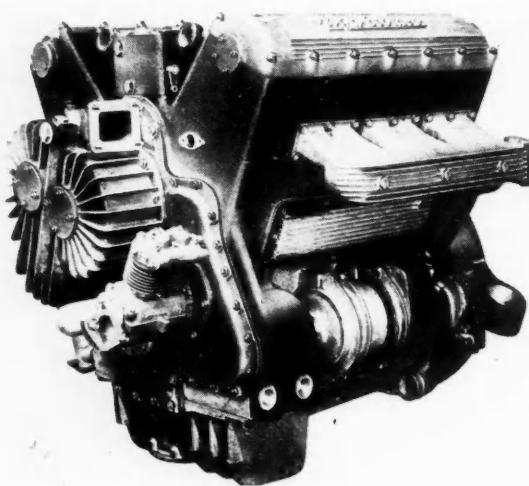


Fig. 1 — Alfa Romeo twelve cylinder two - stroke Diesel engine of 675 cu. in. displacement

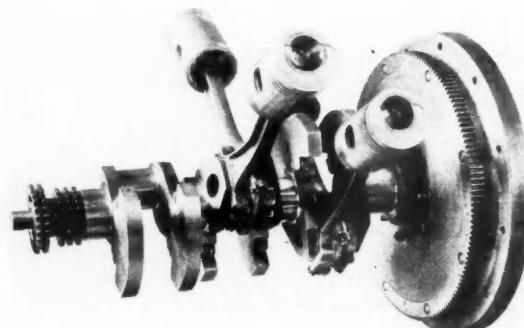
AN automotive-type, two-stroke Diesel engine has been under development for some time by the Italian Alfa-Romeo firm, which is represented in this country by M. Caserta, Detroit. It is the design of Dr-Ing. W. P. Ricart, consulting and research engineer for Alfa-Romeo. Mr. Ricart, who is a foreign member of the S.A.E., had extensive experience in the production of high-speed gasoline and Diesel engines in Spain prior to the outbreak of the civil war in that country.

These two-stroke engines have been built in six- and twelve-cylinder V types. All of the cylinders and the major part of the crankcase are in a single casting of light alloy, into which wet liners are inserted. These liners are centrifugally cast and have their wearing surfaces hardened by nitriding. A single cylinder size is used for both engines, the bore being 3.74 and the stroke 5.12 in., which makes the displacement 337 cu. in. for the six- and 675 cu. in. for the twelve-cylinder.

One of the illustrations, herewith, shows the three-throw crankshaft for the six-cylinder engine. It is an alloy-steel forging which is machined all over, and hardened. The four main bearings have a diameter of 3.35 in. The pistons shown in this photograph are not the latest type, composite pistons with combustion

chambers symmetrical with the piston axis now being used. The forked connecting rods of the pistons in the left-hand cylinders have large steel-backed bearings. The backs of these bearings are hardened and form the

Fig. 2—Crank assembly of six-cylinder V-engine of 110-15-hp. rating.



inner races for needle bearings in the big ends of the rods for the pistons of the right-hand bank of cylinders. This arrangement is said to give the maximum bearing area for a given cylinder spacing. Needle bearings are used also for the piston pins. In the design of bearings for two-stroke, high-speed Diesel engines, some new problems are encountered, and we understand that

in Europe the tendency is toward the use of needle bearings at many points where bearing loads are very high. The piston pins of the Alfa engines are of large diameter and very rigid. Connecting rods have a center-to-center length of 11.5 in., which is about 4.5 times the length of the crank radius, and very generous.

As is generally known among Diesel engineers, one of the difficult problems encountered in the design of a high-speed, two-stroke Diesel engine consists in providing means that will prevent overheating of the piston, and especially of the top ring. The conditions from this point of view appear even more severe in a design of the type under consideration, in which the combustion chamber is located in the crown of the piston and where the piston area in contact with the hot gases is, therefore, greater than in the conventional engine. However, the Alfa engineers hold the view that with exhaust through valves in the cylinder head, and considering the cool-

ing effect of the scavenging air on the pistons, the thermal conditions in this engine are no more severe than in a four-stroke Diesel engine of equal cylinder size and developing the same b.m.e.p. Their aim has been to ensure an adequate margin of safety even when operating at high supercharge ratio and developing a correspondingly high specific output.

A new composite type of piston has

a Two-Stroke Diesel

been developed, with the special aim of protecting the top ring against excessive temperatures. The crown of the piston is made of stainless steel, the skirt of light alloy, and the two parts are screwed together while the crown is at a low temperature due to chilling, and the skirt at a high temperature. In this way a very intimate metallic contact

good deal of the heat absorbed can be disposed of directly to the crankcase oil.

Scavenging air is provided by a Roots blower located at the front of the engine and driven by a triple roller chain, which also drives the two overhead camshafts (one over each cylinder bank) and the injection pump. The blower speed is multiplied through a pair of ground gears, one of which incorporates a safety clutch designed to protect the mechanism in the event of sudden acceleration or deceleration of the engine. Air from the blower enters the transfer channels surrounding the lower end of the cylinders at a minimum pressure of 4.25 lb. per sq. in. gage, and passes through the

cylinder liners, which are provided with tangential inlet ports that produce the well-known helical scavenging effect.

That the flow conditions in the engine during the scavenging period are very favorable seems to be indicated by the fact that a gage pressure of 4.25 lb. per sq. in. is obtained with a blower delivery equal to 1.40 times the piston displacement of the engine. Easy flow during the scavenging period is said to be a factor of outstanding importance in connection with the output characteristics of a two-stroke engine. In order to get an accurate picture of the flow conditions, the pressure diagram for the inlet (or transfer) passages must be studied in conjunc-

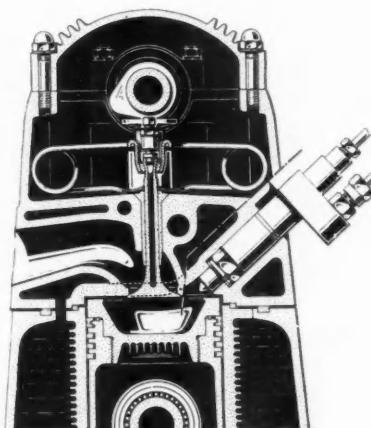


Fig. 3 — Transverse section through cylinder and head of Alfa two-stroke engine

is obtained at the thread surfaces, and it can be seen from the sectional view of the piston that with good metallic contact at the threaded portion, the greater part of the heat absorbed by the piston crown will enter the skirt nearer the lowest than the highest piston ring. In this way the heat stress on the top ring is reduced. The under side of the piston crown is heavily finned, and if cooling by oil spray is employed, a

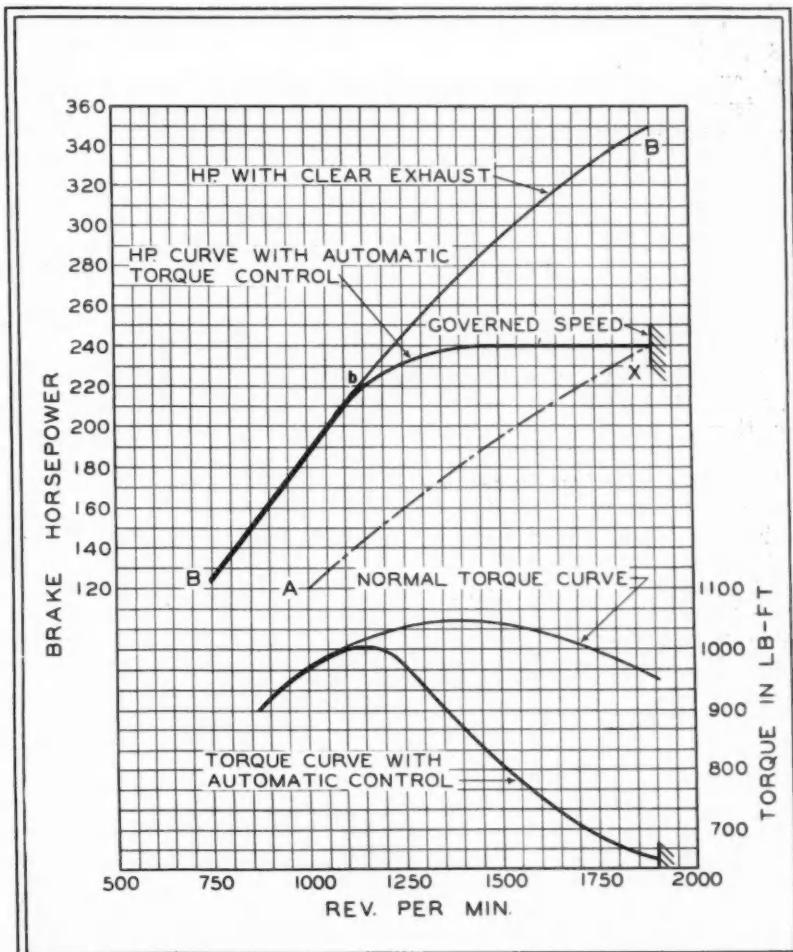


Fig. 4 — Horse power and torque curves for 240-hp. engine with automatic torque control

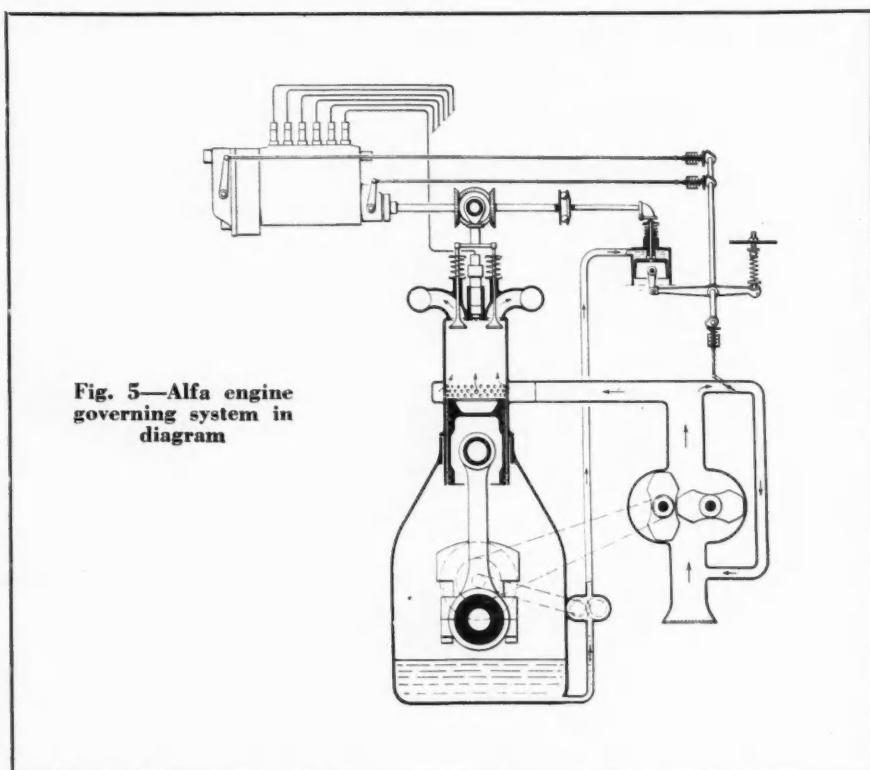


Fig. 5—Alfa engine governing system in diagram

tion with the timing diagram and the exhaust-system characteristics.

There are two exhaust valves of 1.58-in. diameter in each cylinder head, and the valves of each bank of cylinders are actuated directly from the overhead camshaft. A single cam actuates the two valves of each cylinder, by means of a special mechanism which is said to ensure complete synchronization and accurate clearances. Spring surge is guarded against by the use of two scissors-type springs for each valve. It is quite evident that every effort was made to reduce the valve reciprocating weight to prevent unsatisfactory operation of the valves. Such measures seem to be called for by the fact that these valves have to lift once per revolution, instead of only one-half as frequently, as in a four-stroke engine.

Exhaust valves open 72 deg. ahead of, and close 40 deg. after bottom center, but we understand that this timing is not necessarily final, and may possibly be altered in the course of further development work.

Lubrication is by the dry-sump system, and two oil pumps are employed. The lubricating system, moreover, has thermostatic control. Oil pressure is normally carried at about 50 lb. per sq. in.

It is intended to use fuel-injection equipment of Italian manufacture, but Bosch equipment of special de-

sign is also being experimented with. As there is very strong air turbulence in the combustion chamber, of about the same order as in the spherical cells of turbulence-chamber engines, single-jet injection can be used. The cold-starting problem has been looked into, and no difficulty is said to be experienced in starting the engine in winter time without external starting aids.

The really novel feature of the Alfa-Romeo engine is a special type of governor referred to as a "mechanical brain." The principle of this governor is illustrated diagrammatically by one of the drawings reproduced herewith, and is explained by Alfa engineers substantially as follows:

"Imagine a heavy tractor whose weight and service conditions call for an engine of 240 hp., the power requirements being as indicated by the straight line A-X in the horsepower chart. Such a tractor could be endowed with very impressive performance by equipping it with an engine having a horsepower curve like B-B, but the weight and dimensions of the engine, its tax rate, the fuel and tire consumptions of the tractor, and other factors would be prohibitive. But if it is possible to produce an engine which has a theoretical horsepower curve like B-B, of a weight and bulk similar to that of a normal engine with a horsepower

curve like A-X, with automatic features which when point b of the horsepower curve B-B is reached, so modify the operating conditions that the horsepower curve thereafter follows line b-X, very different performance characteristics are obtained. Any slight reduction in the speed of the vehicle results in a large increase in available engine torque, and the vehicle will have a degree of elasticity that is entirely new in the heavy-vehicle field."

Another advantage claimed for this method of control is that it prevents thermal overload on important working parts. The limiting speed and horsepower of a high-speed supercharged Diesel are functions of the r.p.m. and the b.m.e.p. In order to maintain equilibrium between the mechanical and thermal stresses, any increase in the r.p.m. should be accompanied by a corresponding decrease in the b.m.e.p. As a rule, engine failures occur when the mechanical stress due to high speed is accompanied for a long time by the high thermal stress due to heavy torque load. It is claimed that with an engine capable of the performance indicated by the horsepower curve B-B, but held down by its governor to the horsepower curve B-b-X, failures of this type are rendered impossible, and that long engine life is assured. From the drawing of the "mechanical brain" it will be seen that it comprises a hydraulic governor, which controls (1) the injection quantity, (2) the injection timing, and (3) the scavenging pressure, the latter through the intermediary of a valve in a by-pass passage from the delivery to the inlet side of the blower.

Applying this governing principle, Alfa-Romeo has succeeded in building an engine with a flat horsepower curve, developing very close to 110 hp. over a wide speed range. The engine has an over-all length of only 37.5 in. and weighs 1160 lb.

Even better performance is expected from larger units now under development. Ordinarily, by limiting the output of an engine to from 50 to 60 per cent of what it is actually capable, the economy of the engine is seriously reduced, but we are informed that the "mechanical brain" obviates this loss in efficiency by holding such factors as the volume and pressure of the scavenging air, the maximum injection quantity, and the injection timing to the optimum values throughout a wide speed range. The makers hope to obtain a fuel consumption not exceeding 0.4 lb. per hp-hr. over a wide speed range.

Just Among Ourselves

Sad, But It Seems to Be Fact

DURING National Automobile Show week last October-November, estimates of the potential decline in this year's production of motor vehicles varied between 12 and 35 per cent, according to the estimates we were able to collect. As we remember it, two of the leading statisticians were in pretty close agreement that the decline would be somewhere between 12 and 15 per cent. Curiously enough, the deeper estimates we got tended to come from sales executives.

As the second half of the year gets well under way, it looks as if production of motor vehicles—cars and trucks—in the United States and Canada, for the calendar year 1938 would be something like a cold 60 per cent below that for 1937, which added up to 5,015,974 units.

In other words, our estimate of 1938 production would now put the year's total at between 1,800,000 and 2,000,000 units. We will go farther and say that if there is any shading in the final results it will be toward the lower figure.

It has been several weeks now, since we first assembled the data from which these figures proceed. There have been several careful checks in the meantime, arising out of the fact that we don't like the figures any more than you do. But reexamination of the facts and portents does not disclose anything at present which would justify an upward change in the estimate.

Credit Selling Has Its Fallacies

STATISTICS on automobile financing during 1937, released last week show a reasonable decline in the number of cars sold with sub-standard down payment, but an increase in the number of new and used cars sold on terms running 19 to 24 months. Early awareness of this situation led finance companies to institute a campaign to keep car sales on standard terms, and there is considerable evidence that the campaign has produced results during the early months of this year.

On the heels of the 1937 automobile figures, however, comes a release from the National Retail Drygoods Association, which will convene in Cincinnati beginning June 27. Says the N.R.D.G.A.: "Time Ripe for Credit Expansion."

J. A. Hagios, manager of the credit division of the association, is saddled with the statement that "an aggressive attitude toward credit sales, properly protected with adequate safeguards in credit terms and collection policies, can do much to keep up the flow of merchandise during the current months, and provide a stimulus for an upturn in general selling during the latter part of 1938."

As we see it, this is pretty much a case of the wish being father to the thought. If it is carried out aggressively, it will probably mean an increase in the burden of consumer credit which must be liquidated before there can be any real upturn in consumer sales.

Tendencies toward expansion of credit terms by other industries, under existing conditions, put the automobile industry in the spot in a very difficult time, and putting the automobile industry in the spot doesn't do much good to the hundreds of other industries which are dependent on it for business.

It has been necessary for the automobile industry to undertake an educational campaign on the advantages of reciprocal trade policies. Maybe it should undertake a little credit education also.

Where the Law Gets In—

YESTERDAY I lunched with a lawyer. We got to discussing the South Bend Case, in which indictments alleging conspiracy to violate the Sherman Act have been handed down against three automobile companies, three finance companies and most of the top executives in each. When we got into the complexities of the case, my lawyer-friend sighed and said "sometimes I wish I had studied law."

There are probably many other attorneys in the land who find difficulty in understanding the reasons for the indictments, not to mention most of the rest of us who are not learned in the law.

Last week a special writer for one of the Detroit papers added to the complexity of the whole business by writing a series of stories which purported to solve the reasons behind the indictments. It was a laudable attempt, but a little research at the sources indicates that the conclusions were screwball. Some of the reasons why appear in the news section of this issue.

There's going to be a lot of emotion and recrimination mixed up in this South Bend thing, whether or not it ever comes to trial. To understand it completely will require realistic thinking and an approach clear of prejudice.

We're writing this admonition for ourselves, as well as you.

HERBERT HOSKING.

Inertia Shock Absorber

By C. R. HANNA*

SHOCK absorbers employing a control mass for opening and closing the fluid passages have been known in the art for some twenty-five years. One outstanding feature of such shock absorbers is their ability to distinguish movements of the sprung mass of a vehicle from movements of the unsprung mass, so that the one may be resisted strongly and the other only slightly. In all the operative inertia devices which have appeared thus far, the control is either on or off; that is, the resistance is either high or low, as determined by the direction of the body acceleration, but is not controlled between these extremes in proportion to the magnitude of the acceleration.

In the shock absorber to be described, the resisting force is proportional to body acceleration and is, therefore, metered so as to be just adequate to control any spring force which tends to accelerate the body.

When little damping is required, the wheels may follow the road contour with small resistance. Even if the shock absorber should be resisting a movement of the body, it will immediately revert to this low resistance condition in case the wheels encounter a rise or fall in the road surface.

The new shock absorber has an additional control which becomes effective when the movements of the

unsprung mass become abnormal. This feature prevents the wheels leaving the ground when passing over car tracks, cobble stones, etc. In addition to the improvement in safety and tire wear thus effected, the transmission of motion to the body is reduced. This improvement occurs even though shock-absorber resistance to axle movements is increased, the explanation being that the required resisting forces are somewhat

smaller than the spring forces would be if the wheels were allowed to "dance" through large amplitudes.

Obtaining Proportional Control

Before describing the actual shock absorber, the mechanism used in obtaining control proportional to the acceleration of a mass will be considered. In Fig. 1 the control mass is subject to vertical accelerations. The gravity force of the mass is balanced by a very flexible supporting spring not shown. The control mass acts on the poppet valve, closing it with a force proportional to the acceleration of the mass. Any fluid escaping through the poppet valve must rise to a pressure proportional to this force. The poppet valve will automatically cause the right amount of pressure to be developed. The fluid pressure at this position, however, will not be adequate for resisting the movement of a piston unless the control mass is quite large. A second valve, known as a multiplier valve, is used to increase the pressure in the working cylinder without resorting to a large control mass. The spring relief valve shown in the construction serves to by-pass most of the fluid flowing from the cylinder,

*Engineer, Electro-Mechanical Division, Westinghouse Electric & Mfg. Co.

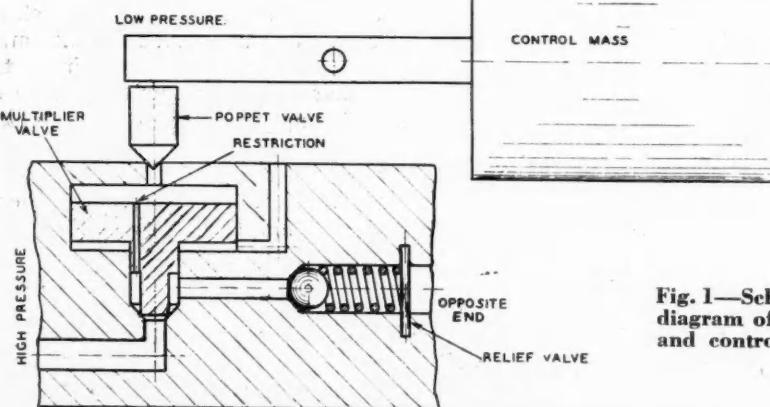


Fig. 1—Schematic diagram of valves and control mass

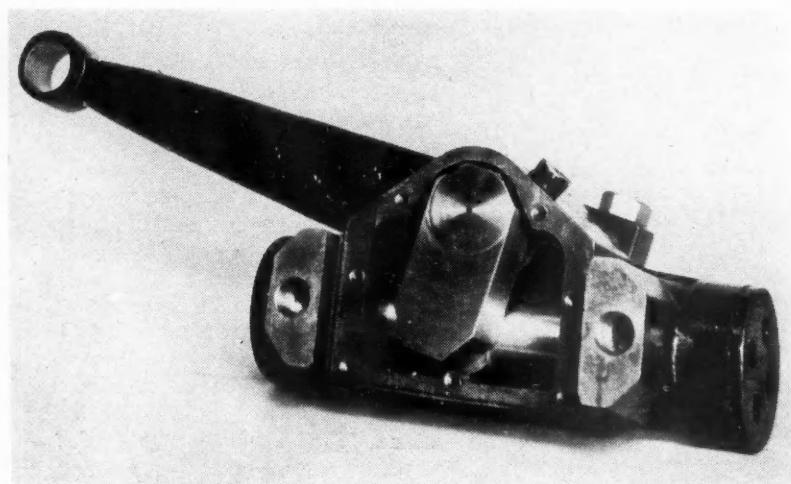


Fig. 2—A practical form of shock absorber with proportional control

of New Design

provides resisting force proportional to body acceleration

so that only a small quantity flows through the inertia-actuated poppet valve.

The operation is as follows: The pressure of the fluid in the cylinder acts against the relatively small area of the bottom part of the multiplier valve. After passing through this valve, its pressure must still be great enough to open the relief valve before any considerable quantity can flow. The fluid pressure at this point, determined by the relief valve, causes a flow through the restriction to the top of the multiplier valve, where it presses downward with a force which balances the upward force on the valve caused by the cylinder pressure. In flowing through the restriction, the fluid loses pressure, the amount of the loss being determined by the velocity of flow through the

restriction, which in turn is controlled by the poppet valve opening. When the poppet valve is entirely closed, there will be no drop of pressure in the restriction, and the full relief valve pressure will appear at the top of the multiplier valve. This, multiplied by the ratio of the top and bottom areas of the multiplier valve, gives the maximum fluid pressure in the cylinder. As the poppet-valve opening is increased, the drop of pressure in the restriction becomes greater and greater, making the pressure at the top smaller and smaller. These smaller values, multiplied by the valve ratio, give smaller cylinder pressures. When the poppet valve opens beyond a certain point, the pressure at the top will fall to a value so small that it cannot balance the upward force on the bottom

of the multiplier valve plus the upward force of the relief valve pressure on the offset near the bottom. Under these conditions, the multiplier valve lifts and ceases to multiply. The cylinder pressure is then practically the same as the relief valve pressure, this being the minimum working pressure. Any pressure between this minimum and the maximum as above described can be obtained by varying the poppet valve opening. The poppet valve automatically assumes a value of opening such that the inertia force of the control mass is balanced by the force of the fluid pressure.

The cylinder pressure is thus determined, between minimum and maximum values, by the force of the control mass on the poppet valve, and yet only a very small fraction of the fluid passes through the poppet valve. The quantity is so small that there is no tendency of the poppet valve to chatter, and the pressures adjust themselves smoothly and continuously between the two extremes, as determined by the acceleration of the control mass.

Description of Shock Absorber

A practical form of shock absorber utilizing this proportional control is shown in Figs. 2 and 3. Fig. 2 shows the method of driving the piston. A pin integral with the crank engages a bronze block which fits into the wide recess of the piston. Fig. 3 is an isometric cut-away of the device.

The control mass and valve mechanism are within the piston. As the piston moves, fluid from one end flows through the proper valves to the opposite end. Any deficiency of fluid received at either cylinder is made up by a flow from the reservoir through small inlet valves. A poppet valve, a multiplier valve, and a spring relief valve are provided for each direction of fluid flow. The control

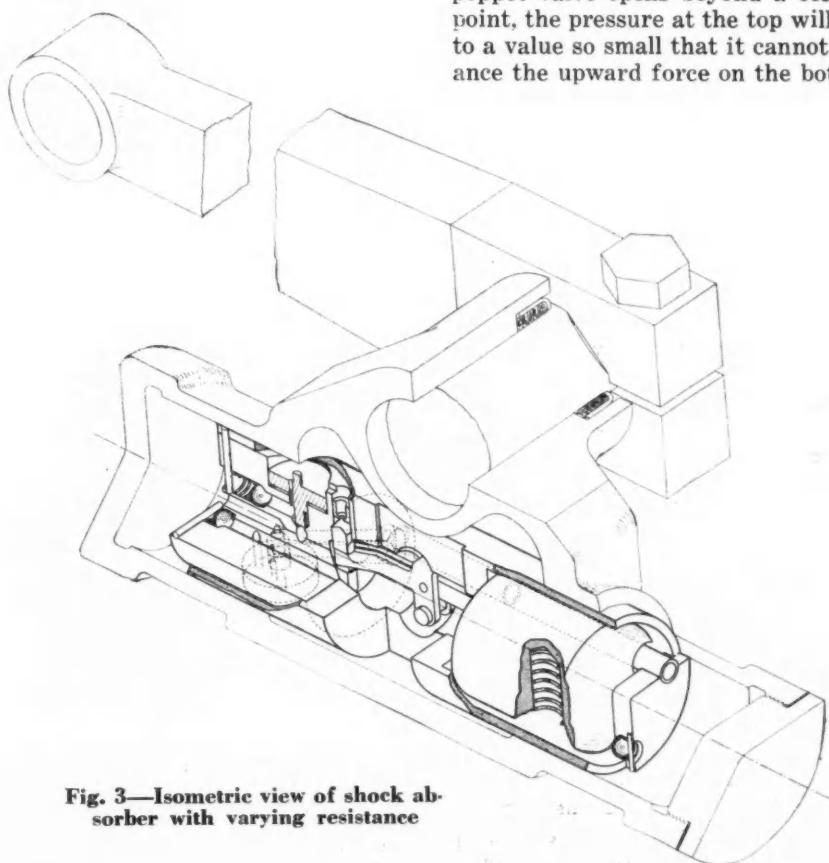


Fig. 3—Isometric view of shock absorber with varying resistance

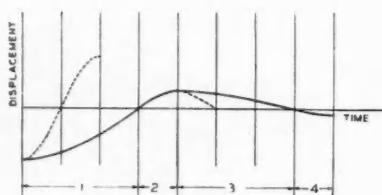


Fig. 4—Theoretical curve of free oscillation

mass is balanced against gravity by a very flexible coil spring, and presses against one or the other of the two poppet valves through a system of levers and pivots. The lever system allows the control mass to close the poppet valves for either vertical or horizontal acceleration of the mass. A straight lever pivotally mounted in an L-shaped lever transmits the vertical acceleration forces. The L-shaped lever with fixed pivot below the first-mentioned pivot transmits forces due to horizontal accelerations.

Consider first the operation of the device in damping movements of the sprung mass of a vehicle. If the springs of the vehicle are being compressed, the arm of the shock absorber will move upward and the piston will move to the left. An upward acceleration of the sprung mass will occur, with the result that the control mass will stay down. This closes the upper poppet valve, which with its multiplier valve and relief valve controls the fluid pressure in the right-hand cylinder. During the rebound, the piston moves to the right against the fluid pressure, and the resistance at every instant is proportional to the upward acceleration of the car body.

When the vehicle springs reach their normal position, the body acceleration reverses. The control mass coasts upward, opening the upper poppet valve, and any over travel of the car body in the upward direction is impeded only by the minimum resistance force of the shock absorber.

The lower poppet valve is at the same time closed in readiness to control the subsequent downward body motion. This valve in combination with its multiplier and relief valves, determines the pressure in the left cylinder of the shock absorber. After the sprung mass reaches its highest position, it begins to move downward with increasing velocity, the piston moving to the left. The control mass continues to press against the lower poppet valve, thus causing resistance to piston movements in proportion to the downward body acceleration.

After the springs reach their normal position, there is no further downward acceleration. The control mass allows the lower poppet valve to open, and the shock absorber is again in the condition of minimum resistance. Any over travel of the body in the downward direction will, of course, give rise to a spring force which again accelerates the body upward, and the cycle just described is repeated.

In the complete cycle, the shock absorber resists strongly during the two quarter cycles corresponding to positive acceleration or increasing velocity of the body. Inasmuch as the resisting force during these two intervals is proportional to the acceleration, the behavior of the car is as though a very great mass were added to the body at the beginning of the rebound and compression strokes, and removed at the points of maximum velocity. This is true because a mass also reacts with a force

(either upward or downward) will be able to cause accelerations only *one-ninth* as great as would be the case if there were no shock absorbers. That is, any unbalanced spring force will divide so that *eight-ninths* is absorbed, and only *one-ninth* remains to accelerate the body. Another characteristic, easily explained by the concept of equivalent mass, is that in a cycle of free oscillation the duration of the two quarter cycles of increasing body velocity is lengthened in proportion to the square root of the mass. In the case at hand, the car mass is m , and the shock absorber equivalent mass is $8 m$, making the total $9 m$. The time of the holding quarter cycles will, therefore, be lengthened by the square root of nine, or three.

Fig. 4 shows this graphically. The first and third quarter cycles are each three times the normal length, while the second and fourth are unchanged in duration. The second and

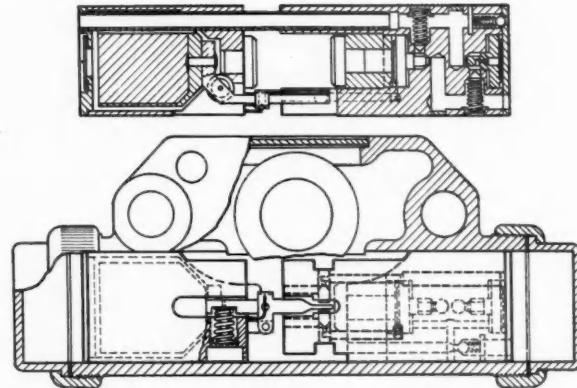


Fig. 5—Small design of a double acting shock absorber

proportional to acceleration. It is convenient, therefore, to speak of the *equivalent mass* of shock absorbers of this type, the definition of equivalent mass being simply the amount of mass which would react with the same force per unit acceleration as the shock absorber. An important difference* between the shock absorber and the equivalent mass is that the shock absorber will dissipate energy, while the mass will only store energy.

In actual designs, this *equivalent mass* is made about *eight* times as great as the sprung mass corresponding to one corner of the vehicle. With the aid of this concept it is easy to grasp certain of the performance characteristics of the shock absorber. For example, with shock absorbers having the above equivalent mass, any unbalanced spring force tending to increase the velocity of the body

fourth are, however, greatly reduced in magnitude, because the velocity at the beginning of each has been reduced by the damping during the quarter cycles 1 and 3. The fractional reduction in the magnitude of 2 and 4 from 1 and 3, respectively, is the inverse of the lengthening of 1 and 3 in time. With the assumed values, this reduction or decrement factor per half cycle is, therefore, $1/3$. Such a rate of decay rapidly brings the sprung mass to rest after any disturbance.

Next will be considered the operation of the shock absorber for movements of the unsprung mass. If the wheel encounters a rise in the road surface, there will be an upward acceleration of the shock absorber arm, and a corresponding acceleration of the piston to the left. The

*In this concept, gravity must not be assumed to act upon the equivalent mass.

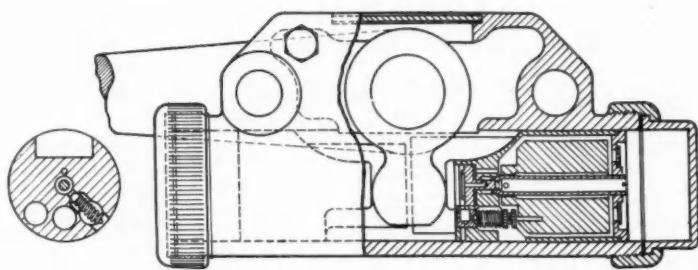


Fig. 6 — Small design of a single acting shock absorber

control mass has freedom horizontally, and will lag behind the piston movement so as to move the L-shaped lever upward to allow the lower poppet valve to open. This causes the pressure in the left cylinder to be minimum, so that the wheel can move upward freely. If the rise of the road happens to occur during a time when the control mass is up, as will be the case when the shock absorber is controlling a downward body movement, the downward acceleration of the body will be quickly reduced to zero (or reversed) by the rise of the road, and the control mass will drop down so that both levers allow the lower poppet valve to open. Any increasing velocity of the axle is, therefore, impeded only by the minimum force of the shock absorber.

During the interval of time that the wheel is being accelerated upward, it accumulates kinetic energy which is in many cases sufficient to carry it off the road surface. At the instant of maximum upward velocity of the axle, the acceleration reverses, and the control mass moves to the left, inasmuch as the motion of the piston to the left is now being retarded. This movement of the control mass causes the L-shaped lever to close the lower poppet valve, with the result that a progressive building up of pressure takes place in the left cylinder, to reduce the over-travel of the axle. It is seen that this deceleration is cumulative, because the control mass presses harder against the valve as the braking effect increases, and, of course, the braking effect also increases with increased force of the mass against the poppet valve.

The action of the shock absorber is similar for a downward movement of the wheels. The axle can drop freely until the instant of maximum velocity, and then damping begins.

*More precisely, it is proportional to the negative rate of change of the relative velocity of the sprung and unsprung masses. The absolute accelerations of the body, however, are so small compared to the absolute acceleration of the axle that the above statement is substantially correct.

The maximum velocity occurs when the tire, which was allowed to expand while the road contour was dropping away, is compressed again to its normal deflection. The damping causes the excess deflection of the tire to be smaller than would otherwise be the case, with the result that the tendency of the wheels to bounce off the ground again is greatly reduced.

Academically, it is of interest to note that this type of damping to axle movements is equivalent to *subtracting mass* from the unsprung mass, because the force developed is proportional to the *negative acceleration* of the axle.* In designing shock absorbers, this *equivalent negative mass* is made somewhat less than the actual unsprung mass corresponding to one wheel, so as not to cause too rapid building up of the decelerating force. In addition, a fairly stiff restoring spring (not shown) holds the control mass in its mean horizontal

position and prevents the control from functioning except for negative axle accelerations in excess of 2 or 3 times gravity, inasmuch as axle accelerations of this magnitude can occur without the wheels leaving the road. The restoring spring is also necessary to prevent the valves from closing when the car is on a grade.

Smaller Designs

Fig. 5 shows a small practical design of shock absorber, embodying all the foregoing features, for use on cars weighing as much as 4000 lb. The piston is actuated by a cam instead of by a pin and sliding block. As in the first design, all the valve-and inertia-control mechanism is within the piston. In this case, the piston is divided for convenience of assembly into two parts which are held in alignment by the passage tube near the outer periphery. Two screws in combination with relatively stiff springs (not shown) hold the halves together against the cam surfaces. The piston diameter is 1½ in., and the overall size of the shock absorber is about the same as that of conventional shock absorbers not having inertia control.

Fig. 6 shows a design which has been simplified by the omission of inertia control for axle movements and downward body movements. In other words, it has inertia control for body rebounds only, which is all that previous practical inertia devices have provided. This new design, however, has the important and

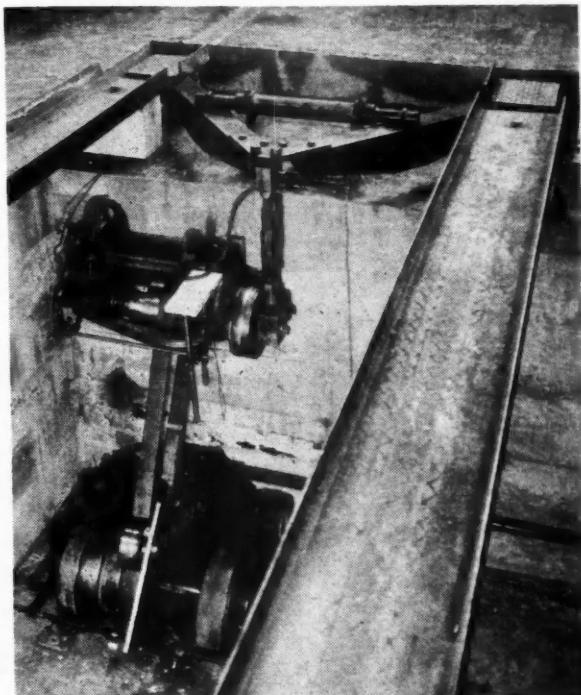


Fig. 7 — Mechanical oscillator used in tests

very desirable feature of proportional control, which is not characteristic of previous devices. Moreover, the inertia control feature has been obtained with very little complications and practically no increase in size. The left cylinder has conventional control, either spring valve or orifice. This half may well be dispensed with, especially in designs for the lighter cars. Such additional simplification will make inertia control shock absorbers practical for even the least expensive cars.

Testing Equipment and Results

The apparatus used in determining riding qualities of vehicles in the course of this development is novel. Of course, road tests are paramount and final, but from them it is difficult to obtain quantitative data. This is a serious limitation in the perfection of a new device, because facts, not opinions, are required.

Fig. 7 shows a mechanical oscillator, by means of which sinusoidal movements of known amplitude and frequency may be applied to wheels of a car. It consists of a crankpin of adjustable eccentricity, which oscillates the V-shaped rocker about a horizontal axis by means of a connecting rod. Two threads support either the front or the rear wheels of a vehicle. The weight of the vehicle is balanced by two helical springs under the treads, and adjustment is made for different car weights by changing the length of the connecting rod. Several sets of springs are necessary to cover the whole range of car weights.

Fig. 8 shows a car in position for test. In the early work with this equipment, wood blocks were used as shown, to keep the car from moving forward and backward. This was preferable to setting the brakes, because it did not hinder the free movement of the vehicle springs. It was found, however, that the blocks stiffened the tires and also prevented a free and natural fore-and-aft movement of the end of the car opposite the oscillating treads. To overcome these difficulties the arrangement shown in Fig. 9 was devised. A length of cable isolated by two flexible springs under tension is fastened to the axle at the end of the car opposite the mechanical oscillator. The springs provide the necessary force to hold the car in a given horizontal position, but do not appreciably resist slight forward and backward movements, which should occur during vertical oscillation of one end of the vehicle. The resonance frequency of the combination



Fig. 8—Car in position for a test.

of car mass and spring cable is so low that no ill effects occur for the range of frequencies used in the tests.

Oscillating movements of the body are recorded on waxed paper by means of a graphic instrument. The record thus obtained is useful in checking the wave form of the oscillations as well as their amplitude.

Curve (a) Fig. 10 shows a typical resonance curve of motion transmitted to the body of a car without shock absorbers for a constant applied motion of varying frequency. Ordinates show the ratio of body movement to tread movement. The resonance gives rise to an increase of over 6:1 in the body motion. Depending on the characteristics of the springs and shackles, this may be as low as 5:1 or as high as 10:1. Above this point the springs readily absorb a great deal of the motion, so that less is transmitted.

Curve (b) Fig. 10 shows the characteristic of the same vehicle with conventional shock absorbers, which make no distinction between body movements and axle movements. The resonance is brought down to about 3:1, but the motion transmitted at the high frequencies is considerably increased over what it was without shock absorbers, being about 70 per cent higher at 5 cycles per second.

Curve (c) Fig. 10 shows the characteristic with double-acting, proportional-inertia shock absorbers. The resonance is brought down to about 2:1, and yet the motion transmitted to the body at the high frequencies is increased only slightly over that without shock absorbers, being about 35 per cent higher at the most un-

favorable frequency. The curve is below that for conventional shock absorbers at all frequencies.

The foregoing results are, of course, in entire accord with the theory of coupled vibrating systems. That it is possible to obtain superior riding performance with proportional-inertia shock absorbers is depicted by the curves of Fig. 11. The experimental curve for the inertia shock absorbers is again shown. The other two curves are theoretical and are calculated with the following assumptions:

1. Ratio of sprung to unsprung mass for end of vehicle being considered is 4.
2. Ratio of spring flexibility (or compliance) to tire flexibility for same end of vehicle is 4.

3. The relation between masses and compliances is chosen to give rise to body resonance at the same frequency as obtained experimentally.

4. The damping force is proportional to the relative velocity of sprung and unsprung masses, the value being the same in both directions.

Assumptions 1 and 2 are close estimates of the characteristics of the rear ends of cars when lightly loaded. The reason for 4 will be explained later. In one of the calculated curves the damping is chosen great enough to hold the resonance down to 2:1. It is seen that the transmission at high frequencies exceeds that obtained in practice with the inertia shock absorbers by as much as 100 per cent. In the other computed curve, the damping is chosen small enough to make the transmission at

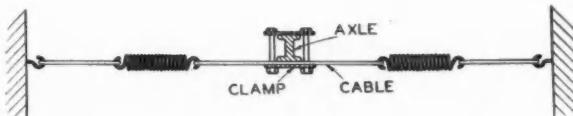


Fig. 9—Flexible cable attachment

5 cycles per second equal to that obtained with the inertia shock absorbers. The resonance is 2.9 instead of 2.05, and occurs over a much broader range of frequencies. At some points the theoretical curve is 90 per cent higher than that for inertia shock absorbers. It is important to note that the experimental curve with the new shock absorbers lies below the other two curves at all frequencies.

Although velocity-type dampers as manufactured always have greater resistance for the rebound than for compression, the assumption of equality in the calculation does not cause much error, for if the resistance to compression were reduced, the resistance to rebound would have to be increased in order to obtain the same values at resonance. This change would not greatly affect transmission at other frequencies. Likewise, conventional shock absorbers with fixed maximum pressure, when adjusted to give the same resonance ratio for a given applied motion, would be expected to follow the same (or even higher) transmission at the high frequencies as indicated by the curves. The reason for assuming equality of damping was, of course, to make possible the computation with linear differential equations.

The following may be added in defense of comparisons of motion as an index of riding performance. It is recognized that acceleration, or even the rate of change of acceleration, is a better index of discomfort. With the sinusoidal tests, however, if there is little departure from a sine wave for the body movement, a curve showing the ratio of transmitted acceleration to applied acceleration would be identical to the ones given. Likewise, a curve showing the ratio of rates of change of acceleration would be the same.

The introduction of a non-linear shock absorber, of which any conventional shock absorber is an example, just as is the inertia shock absorber, will cause some departure from a sine wave in the transmitted motion. The flexibility of the tires aids greatly in reducing this departure, because such flexibility allows the unsprung mass to move with the necessary irregularity to prevent

its appearance in the body motion. Axle movements are found to depart considerably from sinusoidal form, whether the shock absorbers are conventional or of the inertia type. The body movements, however, are practically sinusoidal in all cases. It is, therefore, satisfactory to use curves of transmitted motion at different frequencies as an index of riding comfort.

new shock absorbers is well illustrated by the force diagrams shown in Fig. 12. Ordinates show the force at the arm of the shock absorbers. Abscissae are movements of the shock absorber housing. The three closed loops are for sinusoidal movements at $\frac{1}{2}$ cycle per second, the amplitudes being $\frac{1}{2}$ in., 1 in., and 2 in., respectively, from the mean position. The low frequency of $\frac{1}{2}$ cycle per second was chosen for these indicator diagrams because it represents the approximate lengthening of the cycle which the shock absorbers cause in the case of a free vibration as shown in Fig. 4. Approximate proportionality is shown by the increasing maximum force for the

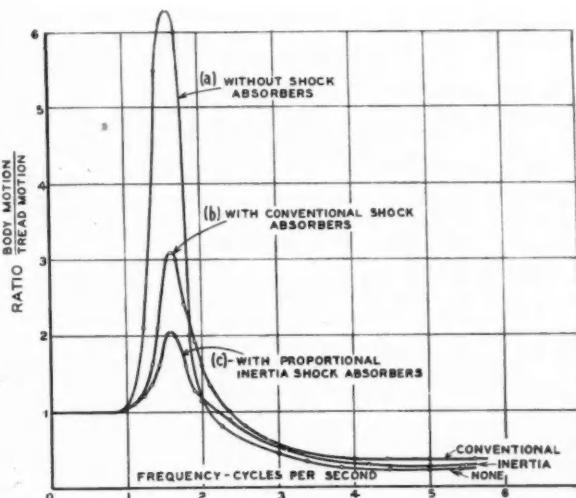


Fig. 10—Experimental curves on resonance ratio

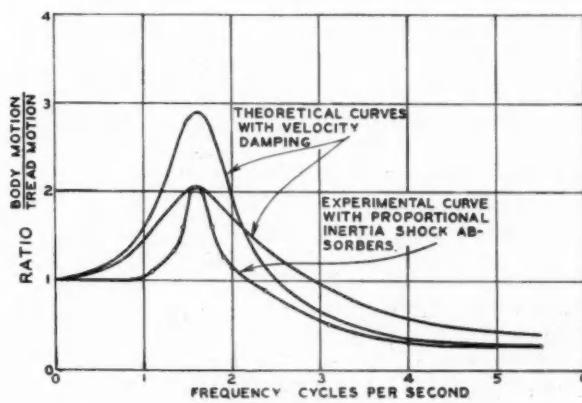
The foregoing has been amply verified by road tests. Even a small change in the resonance ratio, or the high frequency ratio, could be readily predicted from a ride over familiar road before taking a curve.

The proportional control of the

larger amplitudes (which, of course, correspond to larger accelerations) and by the straight line returning toward the origin during both compression and rebound strokes. It is this proportionality that causes the

(Turn to page 798, please)

Fig. 11—Theoretical curves of resonance ratio



How 100-Octane Fuel Is Produced

The Shell company converts octenes to octanes by hydrogenation

MOST of the large aircraft engines brought out in recent years are designed to use 100-octane fuels. Such fuels can be produced from straight-run gasolines by the admixture of relatively large amounts of tetra-ethyl lead or of certain compounds containing oxygen, but the fuel used for the most part consists of hydrocarbon mixtures containing a very large proportion of iso-octane. Iso-octane by definition has an octane value of 100, because the octane value of any fuel is that percentage of iso-octane in a mixture of the latter with normal heptane which has the same anti-knock characteristics as the fuel in question, so if the fuel contains 100 per cent iso-octane its octane value is 100.

A commercial process for the production of fuels of 98-100 octane value from hydrocarbon gases by polymerization and hydrogenation has been developed by the Shell Companies, which have produced no less than 10,000,000 gallons of such octanes in the United States since 1935. The process was described in some detail in a paper entitled "The Catalytic Hydrogenation of Octenes to Octanes," contributed to the mid-year meeting of the American Petroleum Institute by the staffs of the Shell Development Co. and the Shell Chemical Co.

In the first place, a mixture containing large proportions of octene (C_8H_{16}) is produced, and the method of production of this octene mixture was described in a previous paper presented to the Institute in 1937 by McAllister. The hydrogenation process operates in the vapor phase and is distinctive in that it employs low pressures (between 1 and 4 atmospheres gage), and a temperature normally below 350 deg. Fahr. Hydrogenation at these relatively low pressures and temperatures is made possible by the use of a new active nickel catalyst,

which will hydrogenate octene vapors passing over it with the consumption of only a small stoichiometric consumption of hydrogen.

Although the process developed is applicable to the hydrogenation of various olefinic materials, it has been utilized most extensively for the hydrogenation of a mixture of octenes prepared by sulfuric-acid polymerization of butylenes. The octene mixture is the result of interpolymerization of isobutylene and normal butylenes, and consists of several isomers, among which

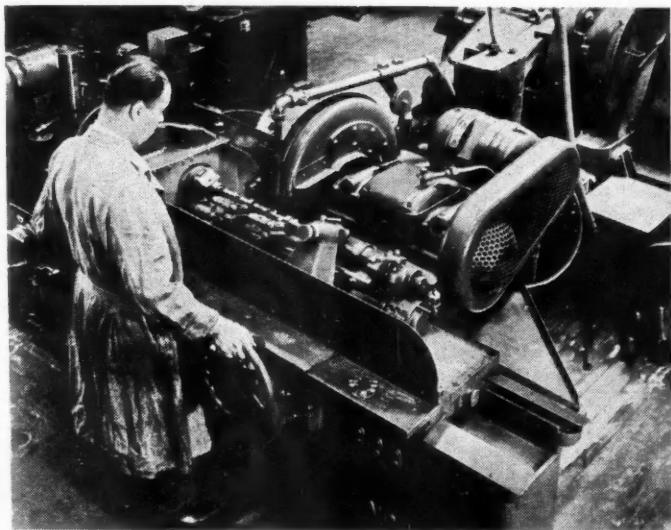
are 2,2,4-trimethyl pentenes 1 and 2. (This octene mixture yields a hydrogenated product which needs no additional treatment prior to blending into fuels.) In spite of the co-polymerization of normal butylenes, which enhances the octene yield, the octanes produced therefrom are only 1 to 2 octane numbers lower than pure 2,2,4-trimethyl pentane, and possess blending octane numbers practically equivalent thereto.

At operating temperatures substantially below 350 deg. Fahr., the rate of reaction is low, and the presence of small amounts of carbon monoxide in the hydrogen feed produces de-activation of the nickel catalyst through the formation of nickel carbonyl. Increasing tem-

(Turn to page 796, please)

Properties of Octane

	Octane from mixed Octene Fraction	Technical Isooctane
Octane No., ASTM	98.2	99.7
Gravity, deg. API	66.3	70.9
Color, Saybolt	30+	30+
Reid vapor pressure, lb.	2.6	2.1
Unsaturation, per cent by weight	1.1	1.8
Copper-dish gum, mg. per 100 ml.	1	1
Accelerated gum, mg. per 100 ml.	1	1
Wright acid heat, deg F.	26	23
Navy acid heat, deg. F.	7	3
Sulfur (nephelometric), per cent by weight	0.0001	0.001
Octane No., ASTM	98.2	99.7
ASTM Distillation, Deg.		
F. Initial boiling pt.	196	205
Dry point	236	235
10-per-cent point	221	210
30-per-cent point	225	210
50-per-cent point	227	212
80-per-cent point	230	214
90-per-cent point	231	215
95-per-cent point	233	216
Distilled, per cent by volume	99	99



A master camshaft automatically controls the contours of all Plymouth camshafts. The grinding wheel is directly in front of the operator who merely puts in the rough shaft and takes out the finished product.

Better Seeing

Publication of an article on the American recommended practice of school lighting in the March issue of *Industrial Standardization* impels us to direct attention to the important work being accomplished in the interest of better seeing. Good industrial lighting—better seeing—is a profitable investment in every factory. Light eases the seeing tasks thereby improving the quality of work on machines and on inspection benches. As *plus* value, good light has its sociological aspect insofar as it saves eyes and contributes to worker comfort. We commend an examination of the chart on page 51 of the article showing the physiological effects of lighting of various intensities. It indicates clearly how light deficiencies may affect good seeing. No comment on seeing is complete without mention of the marvelous work being done along this line at Nela Park by Dr. Luckiesh and his associates.

Active E-P

Major problem in adoption of the active or powerful hypoid gear lubricants has been the chemical attack on certain types of bronze thrust washers used in the axle assembly. We are told by outstanding automotive experts that there is no problem if the washers are made from the right type of alloys. For bronzes used in hypoid rear axles, it is feasible to use any of the conventional

bronzes containing requisitely small percentages of zinc or aluminum or certain combinations of these. Certain production jobs have hurdled all question of compatibility by using washers of molded composition.

Personnel Problems

Impact of complex forces of environment and our present economy were discussed from the viewpoint of the psychiatrist at the recent conference of the Michigan Society for Mental Hygiene by Dr. Henry C. Schumacher. Interpretation of the speaker's message intimates that the worker who presents himself to industry for a job is a finished product of his early environment with all its complexities. It becomes obvious that mental hygiene—our ability to produce individuals who can make the most of their capacities—must start at the very beginning, yes at the cradle. And that must be the task of the community. Our own reaction is that if personnel men were trained in psychiatry, or what is more to the point, if industry were able to use the psychiatrist as a consultant, there would be a grand elimination of many maladjusted workers. Under present conditions this would precipitate a major labor upheaval, since it would create a brand new problem of what to do with those who may be emotionally unfitted for their present or prospective jobs. An appraisal of the realities of the situation reveals many complexities not evident on the surface and indicates

to us that personnel men are doing an excellent job under existing conditions.

Concealed Hinge

Anticipating trend of body design for next season, a certain organization is showing one of the most interesting concealed hinges we have seen in a long time. It's a big, husky hinge—no rights or lefts—only one per door and interchangeable all around. It is attached at the belt and is said to permit normal door pivoting regardless of amount of turnunder. There is plenty of adjustment for door fitting, the claim being that this hinge will simplify door hanging to a marked degree. Best of all, a seasoned body engineer estimates that the hinge can save from 30 to 40 cents per body on low-priced jobs and up to 75 cents per body on higher priced jobs. We give you the story as we got it. If you want more, we shall be glad to put you in touch with the manufacturer.

Vol. 1, No. 1

Early this year marked the appearance of a new handbook service for engineers—*The Neoprene Notebook*. It's free to engineers, designers, metallurgists, and in fact, free to all friends of this department. Having perused No. 1 and No. 2 of the *Notebook*, we can tell you that its contents are well worth the reading while the file over a period of time should provide a living text on rubber-replacing material for the automobile. We are sure you will welcome this addition to your library. And as usual we shall be glad to get your name on the mailing list, if you ask us to.—J. G.

100-Octane Fuel

(Continued from page 794)

perature encourages thermal decomposition of the octene-fraction components, with a resulting decreased yield of octane and increased consumption of hydrogen. The increased consumption of hydrogen results from the hydrogenation of lower-boiling olefins produced in the decomposition, although the decomposition may result in higher-boiling olefins as

well. Further, thermal decomposition normally produces some free carbon as well, which deposits on the catalytic surfaces and renders them inactive.

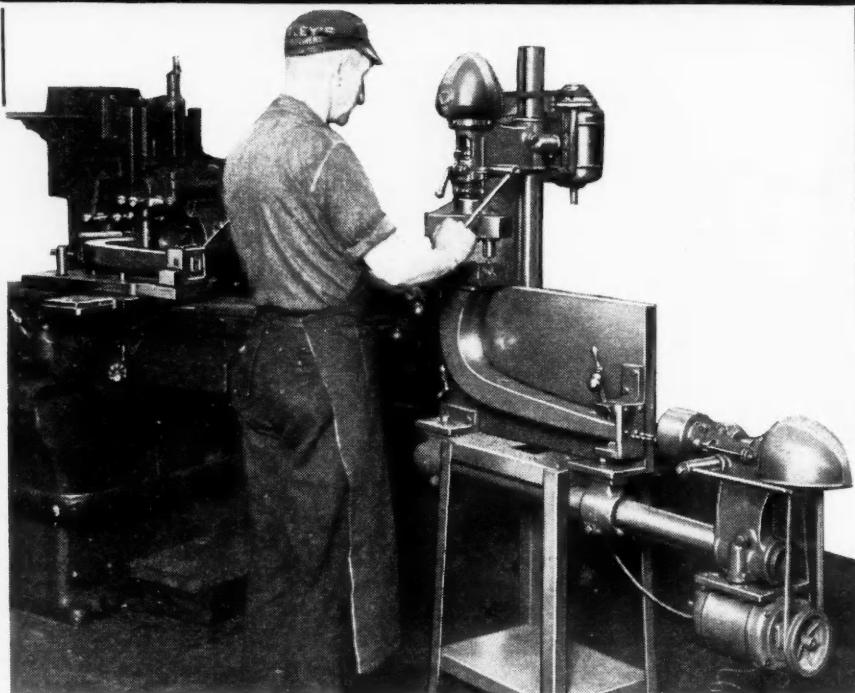
The catalyst developed consists of activated nickel supported on porcelain. The unformed catalyst is a hydrated nickel nitrate impregnated in porcelain. The nitrate is decomposed to nickel oxide, and

then reduced to metallic nickel in a stream of hydrogen. Hydrogen may be conserved by supplying air until decomposition is complete, and introducing hydrogen for reduction only; but the use of hydrogen throughout enhances slightly the activity of the catalyst. After formation, the catalyst is maintained in a hydrogen atmosphere when not in service. Contact with air results in rapid oxidation and consequent loss of activity.

The activated nickel catalyst is susceptible to poisoning, particularly by sulfur. While carbon monoxide and oxygen produce temporary loss of activity, which can be restored by reactivation in place, sulfur produces permanent loss of activity. It is desirable, therefore, to maintain the sulfur content of the octene feed at a minimum. This can be accomplished by proper treatment of butylenes prior to polymerization. The catalyst mass effects substantially complete removal of all sulfur which is contained in the octene feed, producing octanes containing 0.0001 per cent by weight of sulfur; and even after a catalyst loses its ability to promote hydrogenation, it still retains an affinity for sulfur. This retention of ability to remove sulfur is useful, inasmuch as a catalyst no longer able to effect hydrogenation can be used for pre-treating the octene feed in order to reduce its sulfur content before contact with the active catalyst. Proper treatment of butylenes before polymerization reduces the sulfur content of the octene feed to below 0.002 per cent by weight, and a pre-treatment with a spent catalyst reduces this figure on the average to 0.0005 per cent or less. An octene feed treated in this manner then contains only enough sulfur to produce slow de-activation of catalyst. In the Shell plant at Wilmington, Calif., 1000 gal. of finished iso-octane are produced per pound of catalyst charged to the catalyst chambers.

Convenient sources of hydrogen for the process are the pyrolysis of natural gas and the dissociation of ammonia. A process for the production of cheap hydrogen, free of impurities which poison nickel catalysts, has been developed recently by the Shell Chemical Company. This gas contains 85 per cent hydrogen, with only methane and nitrogen as impurities, both of which are inert and unobjectionable. In single-stage operation a 10- to 15-per cent excess of hydro-

NO LABOR COST HERE!



How to put idle time to work!

This photograph shows the milling and drilling of an overarm for a scroll saw. The operator loads the arm in the milling machine, starts the first cut, then loads a previously milled arm into the special drilling fixture set beside the milling machine and drills four holes in the arm. By the time this operation is completed the first cut is finished on the milling machine. The arm on the milling machine is then indexed for the second cut, and, while this cut is being

made, the operator transfers the drilled arm to another Delta drill and taps two holes. The drilling and tapping operations are done during the time that the operator would otherwise be idle—so these operations cost nothing for labor! The portability and adaptability of Delta drill presses, which enable them to be set up alongside another machine to utilize idle time, are only two of the many advantages offered by this low-cost, high-efficiency equipment.

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gen is desirable in order to increase the rate of conversion and decrease the volume of catalyst necessary to produce a unit volume of isoctane. It has been found practical to conserve hydrogen either by means of a two-stage countercurrent flow system or by direct re-cycling of residue gas through a single-stage converter. When the supply of hydrogen is limited and its cost is an important item in the total cost of operation, a two-stage counterflow system is more economical. In a two-stage system the octene feed to the first converter is mixed with vent hydrogen from a second reactor, the second reactor receiving fresh hydrogen together with partially-converted octenes from the first reactor as feed. Vapor from the second converter is cooled to permit condensation of octanes.

The presence of small amounts of sulfur in the octene feed, together with octene decomposition and carbon deposition which accompanies the conversion, would necessitate frequent replacement of the catalyst. However, a method of reactivation has been developed which markedly increases catalyst life. When a catalyst decreases in activity to a certain point, as measured by the throughput capacity of a given volume of catalyst, reactivation in place is practised. The catalyst bed is purged of hydrogen, and air then is introduced for from 4 to 12 hours, depending upon the condition and the quantity of catalyst. The oxidized catalyst again is reduced with hydrogen. Although the initial activity of the catalyst is not completely restored, applying the reactifying operation two to four times increases the life of a charge of catalyst by at least 150 per cent. The activity declines slowly after each reactivation, however, and ultimately the catalyst charge is removed from the converters, and regenerated.

Average properties of finished octane prepared by hydrogenation of a mixed octene fraction are shown in the accompanying table, and for comparison the properties of technical isoctane are given also.

Waukesha Declares 25-Cent Dividend

The Waukesha Motor Co.'s report for the first three-quarters of the fiscal year ended April 30, 1938, shows earnings of \$312,700.93, equivalent to 78 cents per share on the \$5 par common stock, after re-

serve for normal State and Federal income taxes but without provision for undistributed profits tax.

The regular quarterly dividend of 25 cents per share, payable July 1, 1938, to stockholders of record as of June 15, 1938, has been authorized.

Rubber Prices Bolstered by 30% Cut in Export Quota

Action of the International Rubber Regulations Committee in London, May 31, in voting a 30 per cent cut in the exportable quota of crude rub-

ber for the third quarter year, starting June 1, will have the effect of reducing world stocks by at least 50,000 tons during the period and should, in the opinion of American tire industry leaders, strengthen crude rubber prices considerably. The immediate effect of the committee's action was to bolster crude rubber prices which have been unusually weak under lowering American consumption trends. Compared with a new 10-year high of 27½ cents a pound in April a year ago, crude rubber prices reached a new four-year

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low of 10 $\frac{3}{8}$ cents a pound in late March and are still under 12 cents.

The third quarter exportable allowances now is 45 per cent—the first time under any rubber restriction scheme that the quota has been below 50 per cent. The quota was 60 per cent for the second quarter of this year and 70 per cent for the first quarter. The quota started 1937 as 75 per cent and was jumped to 80 per cent for the second quarter. Then, due to the squeeze in crude prices, it was increased to 90 per cent for the second half year, with

a resultant tumble in crude prices from a top of 27 $\frac{1}{2}$ cents to less than 14 cents. This caused American tire manufacturers heavy inventory writedown losses at the year end.

World stocks of crude rubber are approximately 550,000 tons. On the basis of the world's monthly consumption average of 75,000 tons, this means approximately an eight month's supply. Rubber experts figure a five months' stock position as ample. The quota cut from 60 per cent to 45 per cent will cut the exportable allowance to approxi-

mately 58,000 tons a month for the third quarter. Thus, if consumption continues at the rate of 75,000 tons, world stocks should be reduced by at least 50,000 tons for the quarter.

Inertia Shock Absorber

(Continued from page 793)

shock absorbers to hold properly at all amplitudes. In the curves may also be seen the free flow condition which occurs during movements away from the mean position, that is, during negative acceleration of the body. It is this feature which allows the axle its freedom of movement during intervals when the body is not being accelerated positively.

No quantitative data are available on the performance of the new shock absorbers in damping axle movements. Insufficient power was available to move the mechanical oscillator through large amplitudes at the high frequencies. Although many



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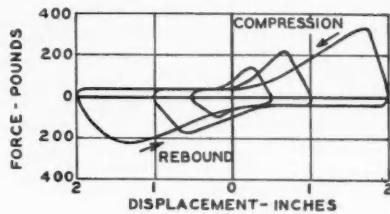


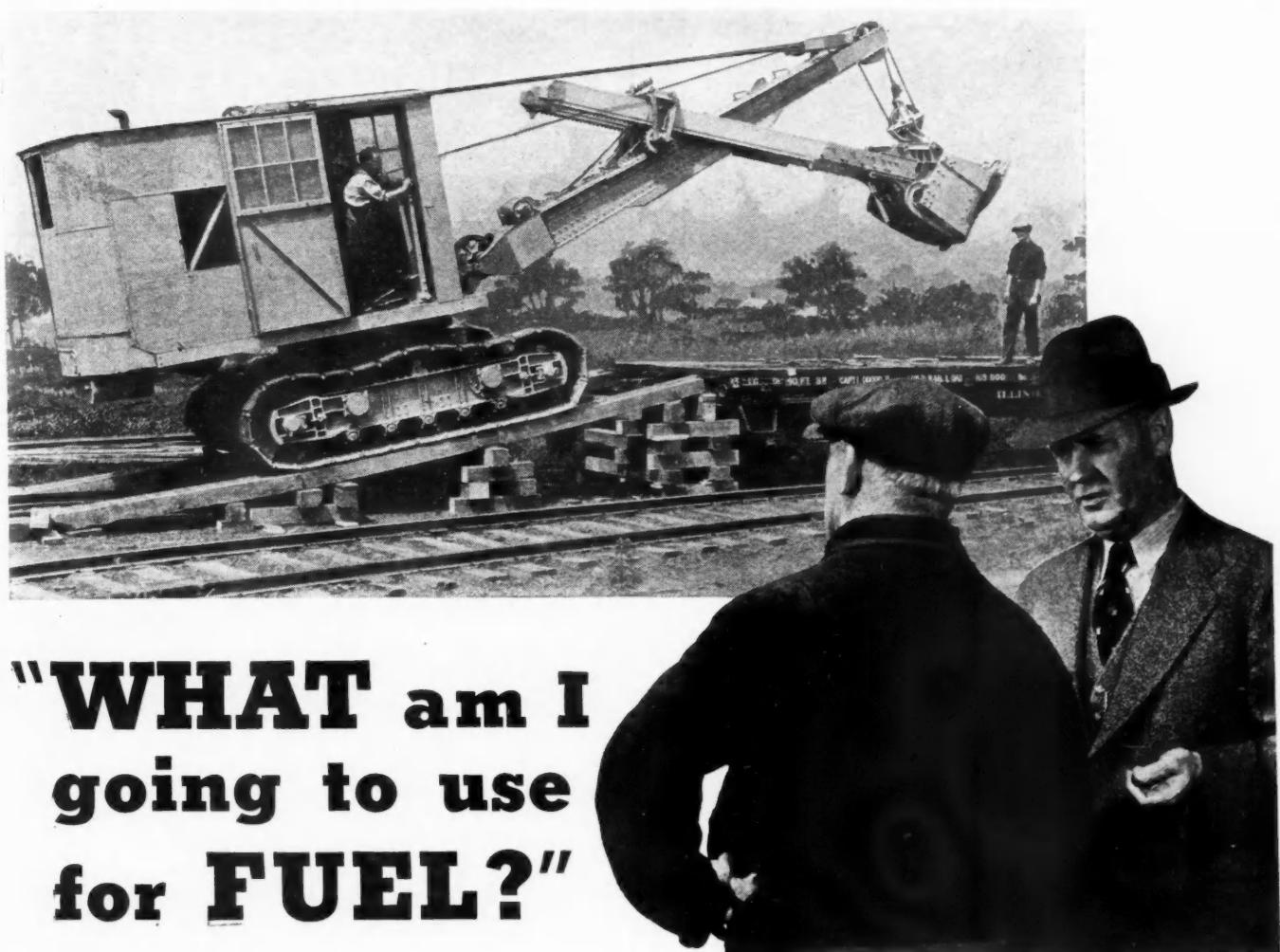
Fig. 12—Force-displacement diagram

tests at small amplitudes were made, these were meaningless, because the corresponding axle accelerations were smaller than those required to bring this function of the new shock absorber into operation.

Numerous road tests over rough cobble pavement, car tracks, etc., have, however, amply demonstrated the improvement in road-holding ability brought about by this feature of the shock absorber. High forward acceleration or rapid braking down grade and around curves do not cause the wheels to "jack-rabbit" off the ground. Very noticeable reduction in tire wear is a further positive indication of the improvement obtainable with such axle damping.

\$570,913 Contract to Lockheed

The Lockheed Aircraft Corp., of Burbank, Calif., has been awarded a \$570,913 contract for 13 Lockheed basic training and commercial planes to be used at the Air Corps flying school at Kelly Field, Texas. The War Department made the award.



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